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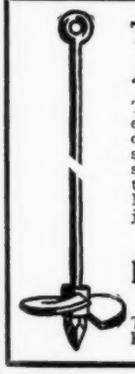

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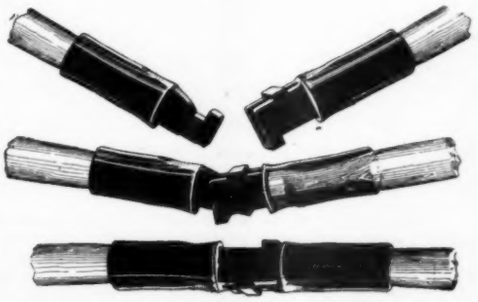

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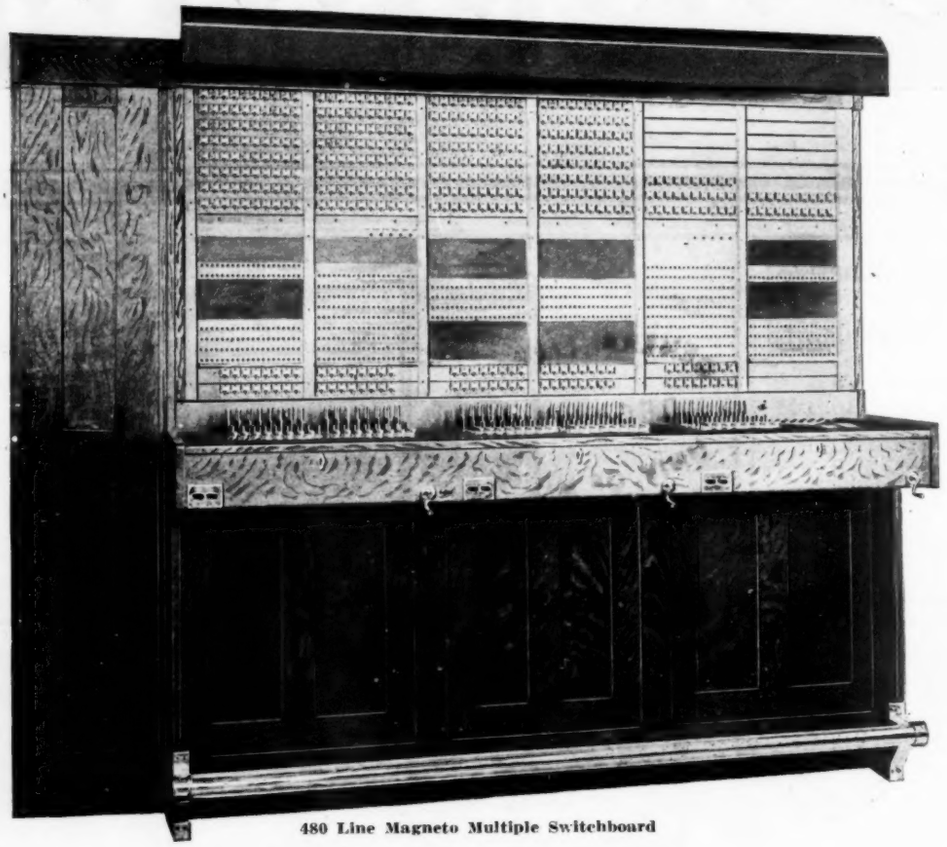

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CURRENT OPINIONS AND COMMENTS

Prevailing low prices of farm products have made the farmers pretty blue lately, and convinced them that they are getting the worst of things.

So far as rates for telephone service are concerned, however, they are the most favored of all classes. Considering how much benefit the dwellers on the farm derive from their telephone service, the cost of that service undoubtedly is the cheapest item in their expenses.

Many, if not all, commissions seem to have a holy horror of raising rural rates. The necessity of increasing the telephone company's revenue is often frankly admitted by the rate-makers, and they bravely enter an order advancing the rates to be charged in the towns, but when the equally reasonable and necessary plan of raising the farm telephone rates is broached, the mercury in the commission's thermometer falls rapidly and some way is found of evading the issue.

"Thou shalt not raise the farmer's telephone rate" is the principal commandment in the average state commission's creed, and it is too religiously obeyed for the good of the service and in fairness to other patrons of the company.

* * * *

Not long ago the Minnesota Independent Telephone Association held a special meeting to consider this and kindred questions. A strong protest was made to the commission because of its apparently fixed policy of not granting a rate to rural subscribers higher than $1.50 a month for metallic lines and $1.25 for grounded lines. It was the opinion of all the 75 members present that these rates are too low, and that fairness demands an increase of at least 25 cents.

A number of applications for rate increases have been filed, but while the commission awarded advances for town lines, no relief was granted for the farm telephones. The commission is an elective body and the telephone men declare that the farmers' ability to cast an organized vote is what influences the commissioners to keep the rural rates down.

The unsatisfactory charges allowed for originating and terminating toll messages also constituted a grievance of the Minnesota companies. They have appointed a committee on legislation which will handle these questions and endeavor to obtain results which will furnish the telephone companies the revenue to which they are justly entitled.

* * * *

In the early days of the telephone industry, it will be remembered, when the people in rural districts asked for telephone service, the Bell organization paid little attention to their demands. It didn't pay to run lines out into the country in those days, and the farmer had to wait until the Independents came along and made the rural telephone what it is today. Along barb-wire fences, way-side trees and all kinds of catch-as-catch-can construction, the wires were strung to connect the lonely farmhouses with each other and with the town.

No one can estimate how much the rural telephone line has done to break the monotony of farm life and add to its comfort—to say nothing of the dollars and cents profit it brought to the farmer himself.

The trouble is, he has been spoiled by the ridiculously low rates given him years ago when all prices were down. Rural telephone rates should have been advanced ten years ago. The high prices since 1915 should be ample justification for another raise.

Rural lines may not require such efficient service as is demanded in towns and cities, but any kind of service is undoubtedly worth more than is paid by the average agricultural community.

It is plainly up to the commissions to stiffen their backbones and compel the farmer to pay a fair telephone rate. No class needs telephone service more than he, and in the long run, he will approve a policy which will insure him an improved grade of service.

* * * *

Consideration is being given to the plan of making a canvass of the members of the United States Independent Telephone Association to ascertain when to hold the next annual convention. The last convention was held in June at Winona Lake, Ind. The question at issue now, however, is when to hold the meeting—during the winter months or in the summer or early fall. Each proposition has its advocates, and probably a referendum on the subject would be the best way to please a majority.

In acting on the matter, telephone men should realize that it is impossible to suit everybody exactly. Those operating in the South do not like to come north in midwinter even to attend a convention. Many telephone men object to June or other summer months because they are busy on construction work.

A date in September or October might prove a happy medium, and that season in the Middle West is pleasant for convention time. Anyhow, if you get a letter from Secretary Deering asking you to express your opinion on the question, make a prompt reply and help the officers of the association who are trying to meet the wishes of a majority of the member companies.

* * * *

Everybody has read much about the foreign rate of exchange and gained a more or less hazy idea about the depreciation of European money compared to the United States dollar, but few of us ordinary mortals actually realize what it really means. TELEPHONY's department in charge of the "Directory of the Telephone Industry" recently had a practical demonstration of the situation which illustrates conditions.

A subscriber in Paris desired a copy of the Directory, presumably for circularizing purposes and was informed that the price was $16. Expressing regret that he could not accept the offer *because in French money, it meant $57*, our Paris subscriber answered in a letter which voices the French outlook most forcibly.

"Thanking you for your kind attention to my request seems somewhat out of place" he writes, "but it is all I can do. In reality, it is only one of many instances of like character which have been brought about by after-war conditions.

"There has been no apparent effort on the part of American business to bring about a more reasonable solution of foreign relations, and as the system of exchange rates is at best only a makeshift, the trade between France and both England and America is rapidly diminishing. We are working night and day to supply our own wants, and as necessity is an excellent spur the time will soon be here when exports from America will be largely limited to raw materials.

"Americans, and America as a whole, are classed as being too anxious to keep the exchange up—of course, the great banking interests receive the most blame and perhaps, justly. After looking the situation well in the face, I am forced to say that, taking the American business man away from his truly American sphere, he is almost entirely unable to grasp the essentials of trade with France.

"One of the greatest American houses is today making a hopeless failure in Paris because its manager cannot see into the mental psychology of the French temperament—and worse still, he won't try. I have been in civil life in Paris about two years now, and as I do not speak English once in two months, I am in a position to form correct opinions on foreign relations in business. In a word, America has made an enemy of the big interests here by failing to deal effectively with the exchange boosters. American business men are failing to handle French trade intelligently even when their prices are right."

* * * *

The writer closed his letter with kind expressions for this journal, wholly aside from his grievance against the distressing exchange situation. Doubtless, he is right. If the shoe were on the other foot and one of us, living in the United States, had to spend $57 for what was selling over there for $16, no doubt we also would feel "riled" over the exchange proposition and probably cancel the order much more brusquely than did the courteous Parisian.

At least, it is interesting to note that France is hard at work, saving and toiling to make up for the ravages and waste of the war. There is no doubt her people will soon rebuild their industry, although the pinch is cruel right at the present time.

* * * *

Falling prices increase the buying power of the dollar. Getting more for your money is equivalent to getting a raise in pay. The way to keep the present wage level is to do an honest, full day's work. Co-operation between employer and employe along these lines will save a lot of trouble.

Prices and Their Probable Course

Extracts from Testimony Before the Minnesota Railroad & Warehouse Commission in Rate Case of Tri-State Telephone & Telegraph Co.—Evidence Which Shows Why Prices and Wages Will Not Return to Pre-War Levels

By Dr. David Friday

Professor of Political Economy and Finance, University of Michigan

In my opinion in the immediate future, within the next 9 months, prices will fall somewhat and then they will become stable on a new level which will be approximately twice as high as the level of prices which prevailed in the years immediately preceding the outbreak of the war—that is twice as high as they were in 1913—and we will then go forward on that new level as a stable level, declining from it gradually in case we have some marked improvement in the general technical process of production, which improvement will lead to low quantitative cost productions.

In case Europe succeeds in making definite plans for a return to the gold standard for its money, we will then decline at a rate which is pretty certain and definite, depending as it does upon the state of the affairs in the arts and upon the condition of politics in Europe, declining from 200 per cent of the pre-war level to perhaps 150 or 160 per cent in the course of five to ten years from now.

Perhaps the best way to show this is to go over the movement of prices during the war. Table I is entitled "Index Numbers of Wholesale Prices in Specified Years and Months, 1913 to July 1920."

Analyzing this table, we find that prices reached their maximum in May, 1920, in which month they stood at 272 per cent of the 1913 prices. Since then they have fallen from that point to 242 in the month of September, 1920. If we look at the "All Commodities" column, we discover that there was very little increase in prices growing out of the conditions of the European war until the very end of the year 1915. In 1916, the prices began to rise and by April, 1917, the year in which we entered the war, they stood at 172 per cent of pre-war

prices. Thereafter they rose rapidly until July, 1917, after that there wasn't much rise, largely due to government control of prices.

At the time of the signing of the armistice in November, 1918, prices stood at 206. Thereafter they fell somewhat until in February, 1919, they had fallen to 197, being a reduction of nine points from the high point of November, 1918. Then they began to rise once more and from the middle of the year 1919, they rose very rapidly until in May, 1920, they began to fall and they are still falling.

The rise from 1913 has not, of course, been the same in all fields. As we look across the line in September, 1920, we see that the rise in cloths and clothing has been from 100 to 278, and that the rise in fuel and light, coal being the commodity that dominates that group, the rise was even greater, and that in lumber and building materials it was over 300, house furnishings 371.

The tremendous increase in price—and by the way, the most rapid increase we observe is in the nine months ending May, 1920—that increase in price has been pretty largely a speculative increase brought about by the very fact that prices were rising rapidly after the signing of the armistice and that the speculators thought if prices could rise after the war was over, the rise probably could go on for some considerable length of time.

As a consequence, we had a very large amount of buying with bank credit for speculative holding, which drove up the price rapidly and to quite an unusual height. At the same time, labor, finding itself fully employed after the war was over, became highly inefficient, not only got largely increased rates of wages by the day or week or hour, but turned out less product for that payment, so that the costs also rose abnormally.

The situation in the fall of 1919 and spring of 1920 is one that was dominated by speculation and by labor inefficiency, both of which are factors which we may expect to disappear by the spring or summer of 1921. We have now some unemployment, and we will certainly have more before the spring comes. This will restore the efficiency of labor and will reduce the cost of production.

On the side of speculation there are three elements instrumental in reducing prices from the high speculative level of the spring of 1920. One of them is the fact that the Federal Reserve Board decided that the very rapid expansion of bank credit loaned to people who were buying and holding commodities, ought to cease in the interest of the country, and they were able to impose that opinion upon bankers generally, and as a consequence the rapid expansion of bank credit was checked.

It was not contracted as is so commonly believed in many circles. What happened was that instead of an expansion of bank credit equal to 5 per cent a month, we have fallen to something nearly normal in the expansion of credit. That is one factor that has checked speculative activities.

Europe has reduced the amount of her purchases in America and has increased the volume of her sales here during the spring and summer. After the signing of the armistice, we all thought that the large European demand for products would fall off, but our government promptly extended the European governments two billion dollars of credit, and the European people used that credit for the purpose of buying American commodities all through the spring and summer of 1919.

In the autumn of 1919, the American government ceased extending any further credit, and that naturally would check European buying, but their desire for goods was so great and the desire on the part of our exporters and manufacturers to sell to Europe at the large prices which Europe was willing to pay, was so great that a quite unusual thing happened. Europe continued to buy from us during the last 12 months until she had purchased from us more than three billions in excess of what she sold us, and that supported this speculation through the winter of 1919-20 up to May, 1920. That has changed and European buying has fallen off and European selling here has somewhat increased and that naturally cut off one of the chief sources of the very high prices.

There is a further factor. It is the

(1913 = 100)

Yr. and Mo.	Farm products.	Food, etc.	Cloths and clothing.	Fuel and lighting.	Metals and metal products.	Lumber and building materials.	Chemicals and drugs.	House furnishing goods.	Miscl.	All commodities.
1913	100	100	100	100	100	100	100	100	100	100
Jan.	97	99	100	103	107	100	101	100	100	100
Apr.	97	96	100	98	102	101	101	100	98	98
July	101	102	100	99	98	101	99	100	101	100
Oct.	103	102	100	100	99	98	100	100	100	101
1914	103	103	98	96	87	97	101	99	99	100
Jan.	101	102	98	99	92	98	100	99	99	100
Apr.	103	95	99	98	91	99	100	99	101	98
July	104	104	99	95	85	97	99	99	97	100
Oct.	103	107	97	93	83	96	105	99	96	99
1915	105	104	100	93	97	94	114	99	99	101
Jan.	102	106	96	93	83	94	103	99	100	99
Apr.	107	105	99	89	91	94	102	99	99	100
July	108	104	99	90	102	93	108	99	98	101
Oct.	105	103	103	96	100	93	124	99	99	101
1916	122	126	128	119	148	101	159	115	120	124
Jan.	108	113	110	105	126	99	150	105	107	110
Apr.	114	117	119	108	147	101	172	108	110	117
July	118	121	126	108	145	99	156	121	120	119
Oct.	136	140	138	133	151	101	150	124	132	134
1917	189	176	181	175	208	124	198	144	155	176
Jan.	148	150	151	176	183	106	159	132	138	151
Apr.	181	182	169	184	208	114	170	139	149	172
July	199	181	187	192	257	132	198	152	153	186
Oct.	208	183	193	146	182	134	252	152	163	181
1918	220	189	239	163	181	151	221	196	193	196
Jan.	207	187	211	157	174	136	232	161	178	185
Feb.	208	186	216	157	176	138	232	161	181	186
Mar.	212	177	223	158	176	144	232	165	184	187
Apr.	217	178	232	157	177	146	229	172	191	190
May	214	177	237	160	178	148	223	173	194	190
June	217	179	245	159	178	150	219	198	196	193
July	224	184	249	166	184	154	216	199	190	198
Aug.	230	191	252	166	185	157	222	221	191	202
Sept.	237	199	255	167	184	159	220	226	194	207
Oct.	224	201	257	167	187	158	218	226	196	204
Nov.	221	206	256	171	188	164	215	226	203	206
Dec.	222	210	250	171	184	164	195	227	204	206
1919	234	210	261	173	161	192	179	236	217	212
Jan.	222	207	234	170	172	161	191	218	212	203
Feb.	218	196	223	169	168	163	185	218	208	197
Mar.	228	203	216	168	162	165	183	218	217	201
Apr.	235	211	217	167	152	162	178	217	216	203
May	240	214	228	167	152	164	179	217	213	207
June	231	204	258	170	154	175	174	233	212	207
July	246	216	282	171	158	186	171	245	221	218
Aug.	243	227	304	175	165	208	172	259	225	226
Sept.	226	211	306	181	160	227	173	262	217	220
Oct.	230	211	313	181	161	231	174	264	220	223
Nov.	240	219	325	179	164	236	176	299	220	230
Dec.	244	234	335	181	169	253	179	303	220	238
1920	...	...	...	...	...	...	...	...	...	...
Jan.	246	253	350	184	177	268	189	324	227	248
Feb.	237	244	356	187	189	300	197	329	227	249
Mar.	239	246	356	192	192	324	205	329	230	253
Apr.	246	270	353	213	195	341	212	331	238	265
May	244	287	347	235	193	341	215	339	246	272
June	243	279	335	246	190	337	218	362	247	269
July	236	268	317	252	191	333	217	362	243	262
*Aug.	222	235	299	268	193	328	216	363	240	250
*Sept.	210	223	278	284	192	318	222	371	239	242

*Continued by Dr. David Friday from the Advance Reports of the Bureau of Labor Statistics.

Table I.—Index Numbers of Wholesale Prices in Specified Years and Months, 1913 to July, 1920, by Groups of Commodities.

things which are durable, like houses and plant extensions, but especially houses. The people began to be dubious of making investments at these enormously high prices. A man will buy food and pay for it out of his week's wages, and will buy a suit of clothes and pay for it out of his year's wages, but when he builds a house that normally will absorb an amount equal to several years' income and eight or ten years' savings, he wants to build at a price at which he can realize if in the future he has to sell, and building was checked in the summer of 1920. It was apparent in March, 1920, that it would be checked, and that had made slacker marketing in certain commodities.

Average wages in the United States as shown by census of manufacturers.

Year.	Average Wage per Year.
1869	$302.08
1879	346.91
1889	444.83
1899	437.41
1904	477.37
1909	518.07
1914	579.61

Wage Movements, 1914-1920.

Year.	N. Y. State Factories (Weekly wage)	U. S. Steel (Annual wage)
1914	$12.48	$ 905.00
1915	12.85	925.00
1916	14.43	1,042.00
1917	16.37	1,296.00
1918	20.35	1,685.00
1919	23.50	1,902.00
1920 (July)	28.49	Not yet available.

Table II. Average Wages and Wage Movements.

So these three factors have been dominant to bring about a decline of this high level, and that decline will continue until further, but it can not indefinitely continue. Along with this increase in prices from 1913 to 1920, there went an increase in wages. So far as these commodities are materials used in the process of producing goods, costs of course, rose, because the commodity price of the things used in production increased. Wages also increased.

Here is a statement showing certain wage movements from 1914 to 1920. (Table II.) This has the relative movement of prices after the Civil War. The lower part of it shows the weekly wages paid in New York state factories, and the annual wages for labor paid by the U. S. Steel Corporation from 1914 on.

For 1918, wages had risen fror $12.48 to $20.35. Had the rise of prices stopped at the beginning of the armistice at 206, the level to which wages reached would have without doubt stopped, especially if unemployment had developed, but they did not stop rising; they continued, and as a result, wages continued rising.

Wages are much slower in rising and likewise are much slower in falling than are general prices. Any wage rate, once established, tends to maintain itself. That is shown pretty conclusively by reference to the figures on the upper part of Table II, which are taken from the census of manufacturers for each decade from 1869 to 1899 and then for five-year periods from 1899 to 1914.

While it is well known that during the period 1869 to 1879, prices fell, wage rates and manufacturers' costs did not fall, and what is true of manufacturers' costs is true of wage rates pretty generally. They continued to rise in 1889 when commodity prices had fallen still further. It was only in 1899, after the depression of 1894-5 that they show a lower level. They rose from that point on, so that with gradually falling prices over a period of practically 30 years, we had rising wage rates. They never did get back to the level of the Civil War, and it is a well-known principle in economics that wages tend to stay at the point that they have reached, no matter what the process is by which they drop to the new point, providing it affects labor generally. I believe, therefore, that we will go forward on a new level of wages.

Now, as wages are on a new level and commodity prices very much higher than they were and cost of production remains upon a new level, and it is a founded principle in price theory and in price studies that the price of goods which have to be produced—and practically all the telephone company or public utility has are produced except the lead, and the raw materials that enter into the production of the things used—cannot for any length of time fall below the cost of production when a new price level has been established for labor and for materials used in production, that price level tends to maintain itself.

The speculative feature of prices will, I think, be counteracted by the restriction of bank credit and by unemployment, but the costs of production will remain approximately twice what they were in 1913 for the future.

Upon analysis of the various statements that are made and the reasoning presented to support the propositions that prices must fall to the pre-war level, I find that there are four things that influence people in their notion that prices will return to the level of 1913. There is, first the general notion that pre-war prices were normal prices in the sense that there was something abiding about them, something permanent, and that the events of war are abnormal events, and that when the events of war have passed and we get back to normal conditions, then the normal price level will be established—the normal price level those people see being the level of the pre-war period.

Insofar as that argument is based upon the assumption that prices for many years before the war had been stable, it is not borne out by the fact if we take Bradstreet's index number of wholesale prices, which is one of the oldest and runs back to 1892. We find that the price level in 1896, which is the lowest point it ever reached, was 5.91, roughly 6, and that the price level gradually rose, steadily and constantly with but one interruption in 1908 after the panic of 1907 when the price level fell 10 per cent, and then quickly recovered itself. That price level rose to 9.21 in 1913.

Prices had, therefore, risen by 55 per cent between 1896 and 1913 despite the fact that we had defeated the political ambitions of W. J. Bryan and had, as we thought, anchored prices to the gold standard. All throughout that period we maintained the gold standard and there were no wars which raised prices—and yet prices had risen 55 per cent. If the price increase which occurred during those years was not interrupted until 1920, prices today would be 22 per cent in excess of the prices of 1913.

The establishment of the Federal Reserve Board System, with its ability to make credit easy and abundant, would probably have accelerated that price movement, even in the absence of war—and had there been no European war, it is highly probable that the price level today would stand 25 per cent above that of 1913 had it continued the conditions existing between 1896 and 1913, but prices do not tend to return quickly to any such normal level.

If you look at history of prices over a century, you find they fluctuate rather widely, and find, too, when you have been through a period of war, whether like the Civil War or the present war, or whether through a period of gradually-rising prices, such as from 1896 to 1913, that a new price level tends to establish itself, because wages rise with prices although less pronouncedly and establish a new cost of production, and they make a new condition under which supply is forthcoming.

The people commonly refer to the law of supply and demand in defending the statement that prices will return to the pre-war level. The law of supply and demand as stated in economic textbooks and as has been for more than half a century, says that prices tend to be fixed at a point which equates supply and demand to each other. It says further that if the demand remains the same and the supply increases, prices will tend to fall and vice versa, and if supply and the conditions of supply remain the same, then if the demand increases, the price will tend to rise and vice versa; but if demand and supply both move together—that is, if demand increases at a high price, and supply is forthcoming only at a high price—then supply and demand

will be equated to each other at a new price.

Supply and demand mean nothing for practical purposes except to state them and be able to supply at rising costs and when you have a new set of costs, you have a new set of supply conditions—all of which is pretty fairly simple but not perhaps well understood by people outside the technic of the profession.

It is well illustrated by the demand for copper, the demand today being 950 million pounds per 12 months or over 75 million pounds per month. Any such demand for copper in the pre-war period would have driven it to 10 cents easy, but today the price is 15 cents, the dominating factor being that no supply of copper to speak of will be forthcoming at any cost less than 15 cents, so that supply and demand are now equated to each other at a different set of prices than the prices at which the same quantity of supply and demand would be equated to each other in 1913.

So I see nothing in the general notion that there is anything stable in the pre-war price conditions which will pull the present prices back to that level.

A more subtle and convincing argument is the argument that after the Civil War prices fell, and that, therefore, they will fall now, because it has been the experience that after wars in the last centuries prices do fall.

The table (Table III) shows the movement of wholesale prices in the United States, England, and Germany, during the years of the Civil War and thereafter until 1891. It is taken from the Aldrich report, the technical name of which is "Wholesale Prices," the report made by the Senate finance committee in 1893 and is Senate docket 1394, possibly known as the Aldrich report.

Year.	U. S.	England.	Germany.
1860	100.0	100.0	100.0
1861	100.6	99.6	97.6
1862	117.8	105.5	101.4
1863	148.6	109.3	103.7
1864	190.5	112.3	106.9
1865	216.8	105.8	101.4
1866	191.0	106.5	104.0
1867	172.2	103.9	102.9
1868	160.5	103.1	100.8
1869	153.5	101.9	102.0
1870	142.3	100.3	101.6
1871	136.0	102.6	105.0
1872	138.8	112.5	112.1
1873	137.5	116.6	114.3
1874	133.0	107.0	112.6
1875	127.6	100.3	107.3
1876	118.2	97.5	106.1
1877	110.9	97.4	105.6
1878	101.3	91.2	99.7
1879	96.6	86.7	96.8
1880	106.9	91.8	100.8
1881	105.7	88.5	100.1
1882	108.5	88.0	101.0
1883	106.0	86.0	101.0
1884	99.4	79.3	94.4
1885	93.0	75.4	89.9
1886	91.9	72.4	86.0
1887	92.6	70.7	84.3
1888	94.2	73.9	84.3
1889	94.2	76.7	87.7
1890	92.3	76.0	89.4
1891	92.2	75.4	90.3

This table is taken from the Aldrich Report, Part I, Page 91, 255, and 295.

Table III. Prices in the United States, England, and Germany. 1860—1891.

(1913 = 100)	United States	United Kingdom.	France.	Italy.	Sweden.	Japan.	Canada.
1913	100	100	100	100	100	100	100
1914	100	101	101	95	116	96	101
1915	101	126	137	133	145	97	110
1916	124	159	187	202	185	117	135
1917	174	206	262	299	244	149	177
1918	197	226	339	409	339	197	206
1919—							
August	226	250	347	368	321	251	223
September	221	252	360	370	319	257	223
October	223	264	382	388	307	271	222
November	230	271	405	436	308	280	227
December	238	276	423	455	317	288	240
1920—							
January	248	288	487	504	319	301	248
February	249	306	522	556	342	313	254
March	253	307	555	619	354	321	258
April	265	313	584	679	354	300	261
May	272	305	550	659	361	272	263
June	269	300	493	615	366	248	258
July	262	299	496	613	363	239	256
August	250	298	501	632	365	235	244

From Federal Reserve Board Bulletin, October, 1920, page 1069.

Table IV. Wholesale Prices Abroad. Index Numbers of Wholesale Prices (All Commodities).

These figures show, first of all, that prices reached the high point of 216 per cent of pre-war prices at the end of the Civil War; that thereafter they gradually fell and got back to practically the pre-war level in 1878 in the United States. The average prices for the five-year period 1866 to 1870 inclusive were 64 per cent above the prices of 1860, and the average prices for the 10-year period 1866-75 inclusive, were 49 per cent in excess of the prices of 1860.

Therefore, we cannot expect by reasoning, by analogy of the Civil War and what happened thereafter, that prices will return to anything like pre-war levels within the next five years, or the average for the five years will be anything like the pre-war level.

Now, there are three important points of difference between the situation today and the situation after the Civil War which militate against the use of the period after the Civil War as an exact parallel to what may be expected to happen now. The first thing is that after the Civil War prices fell immediately, in 1866 to 191 and in 1867 to 172. After this war, we had a period for 18 months in which prices rose enormously.

The second thing is that at this time and in all the years between 1866 and 1879, America was not on the gold standard, she was on the greenback standard, and this fall in prices after the Civil War was in considerable part incidental to the resumption of the gold standard. The greenback price of gold fluctuated very much like those prices. We are now on the gold standard and have no intention to be off it. You cannot expect the establishment of a new standard in America will establish a new level of prices.

You will notice by looking at the movement of prices in England and Germany that they were comparatively little affected. In England, prices did rise 12 per cent, had gotten to that point in 1864. The Franco-Prussian War in 1870 affected England's prices more than the Civil War, but at that time Europe's prices were on one level and we were upon another level, and their competition to sell in our high price market was naturally one of the factors which would tend to bring prices down after that war.

Today, the situation is entirely different as will be shown by this brief table, Table IV., entitled "Wholesale Prices Abroad." Whereas during the Civil War Europe's prices were but little affected and were much below American prices at the end of the Civil War, the rise of prices in the United States is less than that of most of the nations with whom we have international trade relations. The two important exceptions are Japan and China, and their price levels are on much the same plane as ours.

Japan was above us in March and April, but she had a depression then and her prices have been somewhat reduced since, so the situation in that respect is not comparable to the post Civil War situation and we cannot expect the same incidents to pull down our price level as they did after the Civil War.

If traced through, the price movement in detail would find the movement in Europe outran the movement in America throughout the war. Europe pulled up American prices between 1915 and 1917. It was Europe that raised our prices by bidding for our goods—and

she was the prime cause—and sending us a billion dollars worth of gold. My point is that you can't reason by analogy the Civil War period to this period without remembering these points of difference.

There is one other point I would like to make with respect to Table IV. If one were attempting to prove that pre-war levels are normal and tend to be re-established and were citing the experience after the Civil War, in proof of that he would be proving altogether too much with these tables, because the prices did not stop at the pre-war level but continued beyond them. That is especially true in England, where they got to 75 per cent of the pre-war level, and in America, while still in the state of prosperity in 1891, prices had fallen to 92 per cent.

The real cause of the fall of prices after the Civil War was: First, the resumption of the gold standard in this country; and second, the fact that the world never has seen such a period of discovery of new and fertile resources and the opening up of them by the building of transportation lines into the fertile prairie lands of the West, which brought about an enormous increase in production of farm products by the fact that we had a great immigration from European countries which were agricultural countries. These people went onto these lands as skilled agricultural laborers.

We discovered new resources of supply of iron, copper, improved greatly the methods of transportation and cheapened greatly the cost of distributing freight, devised new methods for the extraction of new resources from the earth—copper, iron, etc. There was rapid development in labor-saving machinery, both in manufacturing and farming, all of which reduced the cost per unit of output in the face of the continuation of high wage rates—and whenever you reduce costs, you reduce prices; competition is certain to operate to reduce prices, and that is the prime force in the United States. That is why prices fell so slowly.

If we have an increase and improvement in the method of production which will greatly cheapen production, then we will have again a fall in prices. I can't conceive that we will have such new resources, like the Mesaba Range or Anaconda Copper, or like these fertile fields of the West, but if we do have a large evolution, we will have a gradual fall, but that can't come rapidly.

From now forward we are upon a new wage level in the employment of productive labor which will be very nearly as high as the level now in existence, and the level is at least 2¼ times the pre-war level. There will be some fall in special industries like ship-building and a few of those industries; in some of the lines connected with the automobile industry, there will be some little fall at that point.

There will also be some fall in the wages of unskilled labor because of the fact that we will have new immigrants, although immigration has been practically cut off for five years. That fall will not be more than 10 or 15 per cent in my estimation, because the unskilled labor has always been very near the minimum standard of living, and second because the depletion of labor is at its greatest in those fields of unskilled labor.

Even though we have had immigration cut off for five years, it will take quite a good deal of immigration to make up the normal supply of labor, so that I look for a new wage level approximately twice as high as the pre-war level, and approximately as efficient as the pre-war level too. It is going to be much more efficient than it has been in the last year. In the last year, the wage level per hour has been 2¼ times the pre-war level, and the labor cost per unit of output has been some three or four times as high in many lines.

There are two other arguments advanced as to why prices will fall. One is that, during the war, prices rose parallel to and as a result of an expansion in bank credit. We had in the United States outstanding 18½ billions in round numbers of bank credits as represented by bank deposits in 1914. We have outstanding today, or on June 30, 1920, at least 37 billions, practically double.

There are a great many people who believe that that expansion in bank credit is the prime cause of the increase in prices and, in a general way, they believe we are going to contract that bank credit and that if we do prices will fall correspondingly. Without debating or arguing the question as to whether or not expansion of bank credit is the prime cause of the increased prices, the notion that we will contract bank credit in this country now is, I think, not well founded, and I think it has no foundation in past experience.

First of all, it should be said thus far there has been no contraction of bank credit, but a steady expansion of it. The reports of member banks of the Federal Reserve Board, the reports of the national banks to the Comptroller of the Currency, the reports of the state banks, which I have examined for several states, all indicate that we are still having a steady but slow expansion of credit.

The Federal Reserve Board has openly asserted that it has not contracted credit, that it has simply checked this abnormal expansion. If you will review the history of bank credit from 1890 to 1920, you find that at only two points was there a contraction of credit. There was a slight contraction in 1894 amounting to less than 10 per cent, which recovered inside of 18 months. There was a very much smaller contraction amounting to less than 5 per cent in 1908, after the panic of 1907, which contraction had been overcome again by 1909. In America we have not since that time contracted bank credit.

In 1897, at the time of the recovery from the panic of 1893-4, the amount of credit outstanding was five billion. By 1907 it had become 13 billions, by 1914 it was in excess of 18 billions, and it is now in excess of 37 billions. So we have had a steady increase of bank credit, and there is no ground for expecting any obstruction of it—the most we can hope for is an arrest of the expansion.

There is a fourth reason that people assign and that is that every period of business depression is marked by unemployment and a fall in prices. We have not had a business depression since 1908, have had continued prosperity with the exception of a few months in 1914 and the early part of 1915; therefore, people say that sooner or later we may expect a depression.

Depression is contrasted with a panic as a situation in which production falls off in a marked degree and which is accompanied by unemployment. Those are the incidents of depression, when men who want to work are lying idle, and plants which might be used for producing goods are standing idle. It is true that we have been through a period of prosperity and that we will probably have a period of what is commonly called business depression; in fact, we are having it this moment and it will continue until spring.

We have had no serious depression since 1894. The financial writers generally believed the panic of 1907 would be followed by serious depression in 1908 and 1909, but it was not followed by anything more than a comparative depression. Industries revived in 1909 and went on at a new pace, and with the checking of our rapid credit expansion now, I do not believe it is possible to have any depression more severe than the one of 1908 at this time.

Our industries have become so diversified; we have better knowledge of the situation; our banking is on a sounder foundation—I am not now referring to the Federal Reserve System alone, I am referring to the judgment which bankers use as business men; it is more conservative than it was in the 90's or 70's—so I do not apprehend we will have any serious period of business depression.

The depression of 1908 reduced prices by exactly 10 per cent and that price reduction was recovered before 1910—that is by 1910 we were again on the 1907 level. The depression of 1894-5-6, which brought prices to their lowest point in 1896, reduced them by exactly 24 per cent according to Bradstreet's index number. The price level of 1892 as shown by Bradstreet's index number had been

7.78, while in 1896 it touched 5.91, by 1900 it stood again at 7.88.

Prices may fall within the next nine months; it is conceivable they will fall to 185 or 190, although I don't expect

Years.	Gold.	Retail Prices.	Cost of Living.	Wages.
1860	100	100	100	100
1861	100	104	103	100
1862	113	115	112	101
1863	145	143	129	112
1864	203	170	156	130
1865	157	176	168	150
1866	141	180	170	161
1867	138	172	168	168
1868	140	174	161	169
1869	133	164	156	175
1870	115	157	150	175
1871	112	146	147	179
1872	112	144	148	177
1873	114	137	145	176
1874	111	136	145	172
1875	115	134	141	161
1876	112	129	133	153
1877	105	127	132	144
1878	101	122	132	141
1879	100	118	130	138
1880	100	118	132	139

Table V. Average Annual Price of Gold, Average of Relative Prices at Retail, Cost of Living, and of Relative Rates of Wages: By Years 1860-1880, Taken From "Mitchell —Gold, Prices, and Wages, 1860-1880."

that, but, if they do, I should expect them to recover somewhat in the subsequent year, or year and a half.

My conclusion from all of this is that we cannot reason by strict economics from the past Civil War situation to this. The question as to whether prices will fall and how far they will fall will be a question of how far we succeed in reducing the cost of production, and the extent to which Europe succeeds and is inclined to establish the gold standard and succeeds and draws gold away from us.

But, even though these forces are operative, they can be only operated slowly and the average price for the next five or ten years will be far in excess of the pre-war prices. That is the general line of reasoning and the general line of consideration that agrees with me when I say we are going forward now on a price level approximately twice as high as 1913 and which we will only very gradually recede from.

Table V contains index numbers showing the relative wages in each year from 1860 to 1880. That is in the extreme right hand column. It also shows, in the second column, the cost of gold in greenbacks each year. That bears upon the statement made that the former prices after the Civil War were largely incident to the resumption of the gold standard in 1879. I attach no great importance to the index of retail prices or of the cost of living.

Meeting of Oregon Local Telephone Association at Portland.

The Oregon Local Telephone Association held a convention at The Hotel Portland, Portland, December 17 and 18. Two sessions were scheduled to be held on December 17 and one on December 18.

The Oregon Public Service Commission has asked the Oregon companies to make a monthly report giving an analysis of new construction costs. A number of companies have advised the association officers that there is grave question as to their being able to properly render this report with their present accounting staffs.

This matter was to be discussed at the meeting and the commission was requested to have one or more of its number meet with the companies.

Bell and Independent Association Agree on Compensation.

For over a year the Independent telephone companies in Illinois have had under consideration a contract submitted by the Central Union Telephone Co., providing compensation to the exchange companies for handling toll messages.

An agreement covering this compensation has been reached between the Chicago Telephone Co.—the successor of the Central Union Telephone Co.—and Executive Secretary Jay G. Mitchell, of the Illinois Independent Telephone Association on behalf of member companies of the association. It has been submitted, in the form of a joint stipulation, to the Illinois Public Utilities Commission as acceptable to both Independent and Bell interests by O. F. Berry, general counsel of the association, to be incorporated into orders the commission may issue approving contracts and traffic agreements between the parties to the agreement.

This agreement provides that:

"For all paid messages originating at the exchange of the second party, in its herein-defined territory, for transmission to points on the lines of the first party (Chicago Telephone Co.) and its connecting companies, the second party (Independent company) hereto shall be entitled to retain, as commission, from the toll of each such paid message, including any charge for overtime beyond the initial period, and in lieu of all charges for terminal facilities and services, a percentage of such toll and overtime charge, in accordance with the following schedule:

When the toll rate for the initial period is:	The percentage of the toll charges for overtime included shall be:
10 cents or under	$ .60
15 cents	.40
20 cents	.30
25 cents to 75 cents, inc.	.25

When the toll rate for the initial period is 75 cents or over, the second party shall be entitled to receive the following commissions:

On all messages for which rates are quoted from time to time in the Central Union Telephone Co.'s tariff book, 6 cents per paid minute.

On all messages for which rates are quoted in the American Telephone & Telegraph Co.'s tariff book, 20 cents for each paid message.

Report Charges: Such percentage as is determined in section 7 hereof (present toll contract of Central Union company).

In case the first party shall, by reason of the volume of interchanged communications, or the needs of the service, establish its own switchboard and employ its own operators for the more immediate handling of the communications interchanged under this agreement, which it shall have the privilege of doing hereunder at its option, the commission to which the second party would otherwise be entitled hereunder shall thereupon be reduced to an amount equivalent to 50 per cent of such commission.

It is further stipulated and agreed that the above language shall be written into and contained in such orders as may be entered by the commission approving said contracts (traffic agreements and supplemental traffic agreements) and that said orders shall specifically provide for the modification of said contracts (traffic agreements) in the manner herein set forth and that the settlements for interchanged toll business, under said contracts, (traffic agreements and supplemental traffic agreements) by and between the said parties thereto, shall be made in accordance with the terms and provisions of said contracts (traffic agreements) as modified, on and after the effective date of said orders."

Two-Day Operators' School Held at Bloomington, Ill., Last Week.

An operators' school was held at Bloomington, Ill., December 8 and 9, in the building recently acquired by the Kinloch-Bloomington Telephone Co. for its new home. About 100 operators registered from the eight counties of McLean, Livingston, LaSalle, Woodford, Tazewell, Logan, DeWitt, and Ford.

The first meeting of the school was called to order by B. F. Baker, of Leroy, manager of the Leroy Telephone Co. After expressing his pleasure at seeing so many in attendance he presented W. S. Vivian of the Automatic Electric Co., Chicago, who conducted the school.

Nearly all of the operators had entered telephone work since the last school was held four or five years ago. A number had only worked as operators from two weeks to three months, and out of the entire hundred, probably not more than a dozen had ever attended an operators' school before or had received any instruction in long distance standard operating practices, such as was given at the school.

Owing to the fact that the majority of these girls were unfamiliar with the many different kinds of offices—in fact, never having visited a telephone office

other than the one in which they were employed—considerable time was devoted to a history of the origin, growth and development of the telephone and its importance in our industrial, commercial and social life.

After establishing the fact that *Service* is the commodity telephone companies are selling, Mr. Vivian asked for a definition of service. He received a number of replies, finally getting the one he wanted, namely, that *service is that which satisfies.* The young women were then asked how they could furnish a service that would satisfy. All agreed that it was easier to talk about it than it was to actually do it.

If one could meet a subscriber face to face, it would be far easier to establish a pleasant relation than over a telephone, because they could see each other and better understand. Over the telephone, the subscriber or patron can not be seen. The impressions received by both operator and patron are those which come from the tone of voice used, the words and manner of speaking and the final result.

The voice, therefore, is a very important qualification for an operator if she is to furnish a satisfactory service.

Mr. Vivian believes that unless the individual operator has a vision of the telephone business as a whole and understands her responsibility and opportunity to such an extent that the big purpose in her every effort is to intelligently furnish a service that will be satisfactory, she can not become a successful operator.

She must be sympathetically interested in the wishes of the persons concerned in every call she handles. If she is not feeling well, or is tired or cross, and things either at home or office are not going smoothly, she must control and conceal them so that the subscriber will not know or suspect her conditions or be inconvenienced thereby. If the subscriber is cross or irritable, or even unreasonable, she will be so generous and good-natured about it and will speak in such a pleasant tone of voice, that he will, because of it, change his manner. To do this successfully, the operator must have two other qualifications—understanding and self-control.

Operating conditions are different in different offices, different in size, development and equipment. Some offices have magneto equipment, others common battery and others automatic equipment or, possibly, semi-automatic equipment. With conditions such as these existing rules governing the use of circuits become a necessity. When the individual operator gets this vision of the telephone business and her opportunities in it, and she understands these different and constantly-changing conditions, the rules cease to be a hardship—things to be dreaded—but become a great help and are so considered and used.

Throughout the two days, operators were selected for practice work on the switchboards where imaginary calls were originated, recorded, circuits properly tested, the distant office signaled, tickets passed—in fact, the entire procedure was made just as realistic as possible and in accordance with standard practices.

The closest attention was paid throughout each of the four sessions, and it is confidently expected that there will be a noticeable improvement in service as these young women return to their homes and take their accustomed positions at their switchboards.

On both days the operators were entertained at luncheon at the Women's Exchange.

Self-Valuation

By Miss Anne Barnes

Traveling Chief Operator, Iowa Indep. Tel. Assoc., Des Moines, Iowa.

What is a salaried position worth to its holder?

Is it worth just what is realized on time served?

If the compensation in the holder's thoughts and plans is represented only in terms of clothing, food, and shelter, is this a broad enough view of self-valuation?

Is it possible for the holder to grow bigger, broader, or learn more about the work she is doing, or the work of the higher-salaried position, if she has only this viewpoint?

Has one any interest in her work beyond the proper performance in such a case?

Can one give her best under such circumstances?

Is service sold under these conditions a fair exchange for the compensation agreed upon?

Is such an employe ever worth the compensation received?

Is such an employe a safe influence in an organization?

Is such an employe a loss to an organization when services are discontinued?

Does not one's services in any line of work, or profession always call for the best, regardless of the compensation?

* * * *

An employer of women sat at his desk looking over a number of applications. His secretary noticed that he glanced quickly to a particular place on each application, then turned disappointedly to her saying: "There is not one who will qualify for the positions I want to fill. Turn them over to the third floor manager. He may find a few who will mechanically qualify, and if they do not, there is not much loss."

The secretary picked up the applications and on her way down to the third floor, she glanced over them as she wondered how her employer could turn down applicants he had not personally interviewed. Her attention was arrested in nearly every case at the "Reason—for leaving last employment" space.

This is what she read: "Tired of working at Blank's; wanted a change."

Then she realized why these applicants had not been personally interviewed by her employer. And she thought of the old saying about the rolling stone. She thought of the time five years before, when she, too, had sat and waited in that anteroom with a number of other applicants. She had wondered how they could be so indifferent when her heart was beating at every sound. She recalled when the secretary came out, dismissed the others and told her she could come in as Mr. Brown wanted to talk with her, how sorry she felt for those other girls although they did not seem to be much affected.

And oh! Those wonderful five years. How much she had learned! How much still to learn!

While she was out, her employer sat thinking: "Why are there not more girls of the type of my secretary? She has put so much of herself into the organization that she has become a part of it—not a mechanical part, but a brain part."

Girls, what are you to your organization?

Have you woven your efforts into the company plan for service—or is the service you render the loose-end kind which must constantly be straightened out and put into proper place again?

Think about it—classify your service!

Switching Equipment Computation

General Principles of Computing the Qualities of Telephone Switching Equipment—Two Methods Showing the Practical Application of Principles in Office of 6,000 Working Lines—Paper Presented Before Western Society of Engineers

By Fred L. Baer

A knowledge of the amount of traffic in a telephone exchange and its distribution with respect to time and destination is essential to be able to provide central office equipment which is adequate for the subscribers' needs. In the planning of an exchange, it is important that the network be so designed as to accommodate the anticipated traffic demands on an economic basis, since in no other industry is there found such a heavy plant investment for the relatively short period of its useful service.

From the standpoint of the subscriber, telephone service does not measure up to its fullest efficiency unless facilities are available for completing his connection whenever desired. On the other hand, to provide the necessary equipment to take care of all emergencies and traffic demands not anticipated, would require an investment that would entail such high charges for service as to defeat its own purpose. For good commercial telephone service, therefore, we are chiefly interested in knowing how much switching equipment to provide so that not more than a certain number of calls, say an average of 1 to 100, or 1 to 1,000, will be lost.

For computing the number of trunks required to carry efficiently a given amount of traffic, various formulae are in use, some determined empirically, and others based on the laws of probability, although it seems needless to establish with extreme accuracy what particular formulae or set of curves to use in computing quantities of equipment, when we consider the much greater error possible in the compilation of the traffic date, and in the assumptions of future growth and distribution of traffic.

A review of various articles published in recent years* brings out these facts:

1. That a fairly fixed relation exists between the number of busy-hour calls of a given duration, and the maximum number of simultaneous calls during the busy hour.

2. That within the limits of holding times, as ordinarily encountered in telephone practice, the preceding relation holds true regardless of the number of busy-hour calls and the average holding time, so long as the product of these two factors remains constant.

*See bibliography at end of paper. (Since the preparation of this paper, the October issue of the British Post Office Electrical Engineers' Journal is at hand containing a mathematical review by G. F. O'Dell, of some of the articles referred to here and some editorial articles.)

3. That the average calling rate of a large group of subscribers usually differs somewhat from the average calling rate of a small part of that group.

While all of the methods described in the various articles are very interesting, since the ultimate results shown (Fig. 1) do not differ materially, it will not be necessary to go into details regarding the derivation of the curves, but use will be made of the results only.

Let A equal average number of calls during period (call hours $T\ C$);

C equal average calls during the busy hour;

T equal average holding time in hours;

X equal number of trunks; and

P equal probability.

Campbell's empirical formula $X = T\ C + 2.8\sqrt[3]{T\ C}$, later changed to $X = T\ C + 3.7\sqrt[3]{T\ C}$ was derived from observations of calls handled by groups of 40 or less trunks. If $X = 10$, the traffic indicated by this formula would be carried with a probability of loss of 1 call in 100. In the practical application of this formula to larger groups, certain percentages have been added that have not been taken into account by the various commentators In curve E, this formula is platted without the percentage factor.

The probability that in a certain interval there will be various numbers of simultaneous calls may be represented as follows:

$$\text{O calls} = P_0 = \frac{1}{\left(1 + a + \frac{a^2}{2!} + \frac{a^3}{3!} + \ldots\ldots\infty\right)} = \mathrm{E}^{-a}$$

$$\text{1 call} = P_1 = \frac{a}{\left(1 + a + \frac{a^2}{2!} + \frac{a^3}{3!} + \ldots\ldots\infty\right)} = a\,\mathrm{E}^{-a}$$

$$\text{2 calls} = P_2 = \frac{\frac{a^2}{2!}}{\left(1 + a + \frac{a^2}{2!} + \frac{a^3}{3!} + \ldots\ldots\infty\right)} = \frac{a^2\,\mathrm{E}^{-a}}{2!}$$

$$x \text{ calls} = \mathrm{P}_x = \frac{\frac{a^x}{x!}}{\left(1 + a + \frac{a^2}{2!} + \frac{a^3}{3!} + \ldots\ldots\infty\right)} = \frac{a^x\,\mathrm{E}^{-a}}{x!}$$

$$x \text{ or more calls} = \mathrm{P}_{(x+)} = \mathrm{E}^{-a}\left(\frac{a^x}{x!} + \frac{a^{x+1}}{(x+1)!} + \frac{a^{x+2}}{(x+2)!} + \ldots\right)$$

$$\text{More than } x \text{ calls} = P_{(x+1)+} = \mathrm{E}^{-a}\left(\frac{a^{x+1}}{(x+1)!} + \frac{a^{x+2}}{(x+2)!} + \ldots\right)$$

The probability that in certain intervals there will be x calls in progress in a group limited to x outlets, is expressed by

$$P_{Lx} = \frac{\frac{a^x}{x!}}{\left(1 + a + \frac{a^2}{2!} + \frac{a^3}{3!} \ldots\ldots \frac{a^x}{x!}\right)}$$

This latter expression more nearly represents a theoretical measure of the lost calls, while the expression for P_x above is a very accurate approximation and lends itself to ready calculation. This is shown as curves C and D in Fig. 1.

The results for the expression P_{x+} are in more general use, and while perhaps not theoretically representing a measure of the lost calls, in providing slightly more equipment for a given amount of traffic, the error is on the safe side. This is shown in curves A and B, Fig. 1, and tabulated in Table A.

For the purpose of this paper, the values of curves A and B shown in Fig. 1, and in Table A will be used. These values have been taken from the table appearing in an article by E. C. Molina, of the American Telephone & Telegraph Co., published in the American Mathematical Monthly of June, 1913.

The first requisites for determining the quantities of equipment for an automatic office in an exchange area, are to know the number of lines affected, the various classes of service given, the number of calls per busy hour and the holding time or average duration of calls within the office as well as calls to other offices. It is also essential to know what provision is to be made for growth during the initial period as well as the provision for the ultimate.

It is generally recognized that, when an automatic system replaces a manual system, the average calling rates per station or per line are increased and that the average holding times are decreased. It is also known that the decrease in holding time is great-

er than the saving in operating time; in other words, the average duration of conversation decreases. It is reasonable to assume that, in any community, the amount of conversation carried during a given period, would be practically the same whether carried by an automatic or a manual system.

Trunks	$P=.001$ TC	$P=.01$ TC
1	.0010	.010
2	.0454	.149
3	.191	.436
4	.429	.823
5	.739	1.28
6	1.11	1.79
7	1.52	2.33
8	1.97	2.91
9	2.45	3.51
10	2.96	4.13
12	4.04	5.43
14	5.20	6.78
16	6.41	8.18
18	7.66	9.62
20	8.96	11.1
30	15.9	18.7
40	23.3	26.8
60	38.9	43.5
80	55.2	60.7
100	71.9	78.2
140	106.3	114.0
180	141.4	150.3
200	159.	169.
300	249.	261.
400	341.	355.
500	434.	450.
600	527.	545.
700	621.	640.
800	715.	736.
900	810.	832.
1000	905.	928.

Table A. Busy-Hour Average Calls and Trunks to Care for Them.

It can, therefore, be considered that the product of the number of calls and the average conversation time for a given period, remains constant, regardless of how the traffic is handled. But if we assume that the product of calls and holding time are the same under manual and automatic conditions—that is, if we do not deduct the saving in operating time—then there would be a margin for probable increased amount of conversation incident to the use of the automatic system.

It is, of course, not reasonable to use the calling rate as estimated for a manual system and the holding time as estimated for an automatic system, since the resulting product will represent traffic somewhat lighter than that which is likely to be experienced.

In compiling data for use in determining quantities of automatic equipment, the calls and holding times, if based on manual experience, should be projected to the initial period and should be based on observations made during the busy season of the year.

Arrangement of Multiple.

If a trunk-searching element is limited to 10 outlets, the amount of traffic handled is independent of the order of selection, assuming the selection to be instantaneous, as is practically the case. That is, if 10 outlets are available, say to 100 selectors, it is immaterial whether the outlets are tested in regular rotation beginning with the first one each time, or whether they are arranged so that the first 10 selectors will begin by testing the first outlet, the second 10 by first testing the second outlet and finishing with the first, the third by first testing the third outlet and finishing with the second, etc.

The first arrangement, however, would not be used because of the excessive wear on the switch connected to the first trunk and the excessive amount of rotation on each of the hundred first selectors, since if the traffic indicated an average of 4.13 simultaneous calls, it would mean that half the calls would be extended to the first four trunks, and for the remaining half the switches would rotate over at least four contacts, to find one of the six remaining trunks.

Order of Selection	Traffic per Trunk	Summation of Traffic
1	.62	.62
2	.60	1.22
3	.58	1.80
4	.54	2.34
5	.51	2.85
6	.457	3.307
7	.387	3.694
8	.287	3.981
9	.139	4.120
10	.01	4.13

Table B. Traffic Handled per Trunk in Group of Ten.

Table *B* shows the amount of traffic handled per trunk in a group of ten when the trunks are selected in regular rotation beginning from the first. These figures were derived from the 1 in 100 column of Table *A*.

From Table *B* we can determine the probable traffic-carrying capacity of a group of trunks with various methods of bank multipling. Consider Case 1, Fig. 2, where the first five trunks in each group would handle 2.85 *T C* and the common group would handle 1.28 *T C*, or a total of 6.98 *T C*.

This is capacity greater than that of either a group of 10 and a group of 5, or 1.5 groups of 10, but not so great as that of a group of 15. Advantage is not taken of this increased capacity in the direct computation, which in this case would be 1.5 groups of 10, but the arrangement is used to provide an additional margin of about 12½ per cent to care for unforeseen variations.

In Case 2, having three individual groups of 5, in a common group of 5, the 20 trunks would carry 9.83 *T C*, or about 20 per cent more than two groups of ten. In Case 3, the 30 trunks would handle 14.725 *T C* or about 19 per cent more than three groups of 10. In Case 4, in a similar manner it may be computed that the 20 trunks would handle 9.83 *T C* or about 20 per cent more traffic than two groups of 10.

In the following, it is proposed to show

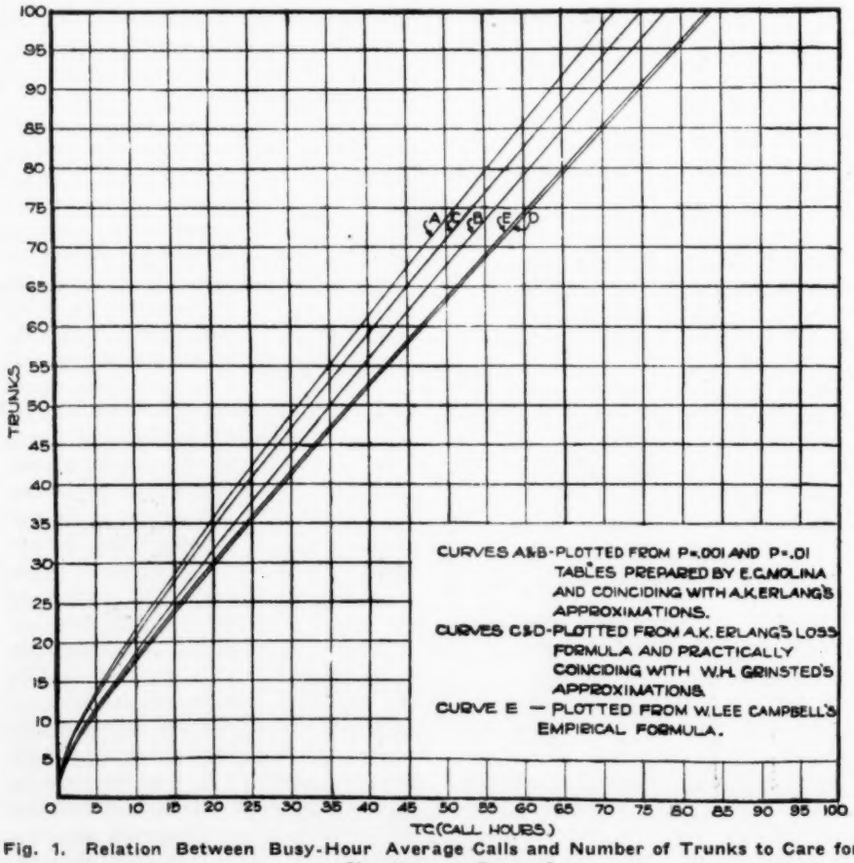
TRUNKS
TC (CALL HOURS)
A & B
C & D
E
CURVES A&B - PLOTTED FROM P=.001 AND P=.01 TABLES PREPARED BY E.C.MOLINA AND COINCIDING WITH A.K.ERLANG'S APPROXIMATIONS.
CURVES C&D - PLOTTED FROM A.K.ERLANG'S LOSS FORMULA AND PRACTICALLY COINCIDING WITH W.H. GRINSTED'S APPROXIMATIONS.
CURVE E — PLOTTED FROM W.LEE CAMPBELL'S EMPIRICAL FORMULA.

Fig. 1. Relation Between Busy-Hour Average Calls and Number of Trunks to Care for Simultaneous Demand.

how the traffic data are used to compute the quantities and distribution of the various elements of switching equipment in a Strowger automatic exchange.

Primary Line Switches.

Since there is a line switch associated with each subscriber's line, the number of working primary line switches is determined from the number of working lines.

When a subscriber's intermediate distributing frame is interposed between the line switches and the connector banks, so that any line switch can be cross-connected to any terminal number, it is necessary, due to circuit requirements, to group the primary line switches in classes for the following service: Flat rate, message rate, and pay-station rate. On the other hand, if an intermediate frame is not used and the line switches are permanently connected to the terminal numbers, then the flat rate group must be further subdivided into individual lines, party line and P.B.X. groups, and the message-rate group must also be subdivided into individual line and P.B.X. groups.

In either case in grouping the line switches for the various classes of service, precautions should be taken so that the pay-station lines and message-rate lines do not have access to the same first selector switches; otherwise, under certain conditions, there would be premature registration of meters on message rate lines, due to the circuit requirements of pre-payment pay-station service.

The number of primary line switches provided for the initial period for each class of service is usually 5 per cent greater than the number of working lines and the number of terminals (connector numbers) is usually 10 per cent greater than the number of working lines.

Size Group	Less than .8	.8 to 1.3	1.3 to 2.	More than 2.
25	70	60	50	40
50	50	44	37	30
75	40	35	30	25
100	35	30	25	20

Table C. Average Calling Rate per Line.

It is recognized that when the average calling rate per line for a certain class of service is based on the originating traffic of a thousand or more lines, the calling rate for any small groups, such as 25, 50, 75 or 100 lines, will vary from this average rate. However, if the average calling rate is based on a smaller number of lines, there will be little or no variation when considering small groups. Table *C* shows the percentage variation that can be allowed for the various small groups at different calling rates.

Prim. Line Switch per Group.	100		75		50			25		
Calling rate per working line	.85	1.	1.1	1.28	1.61	1.89	2.1	2.63	3.16	3.72
Calling rate per equipped line	.81	.957	1.04	1.22	1.53	1.8	2.	2.5	3.	3.54
Trunks per group...	9	10.	9.	10.	9.	10.	7.	8.	9.	10.

Table D. Proper Grouping for Various Calling Rates.

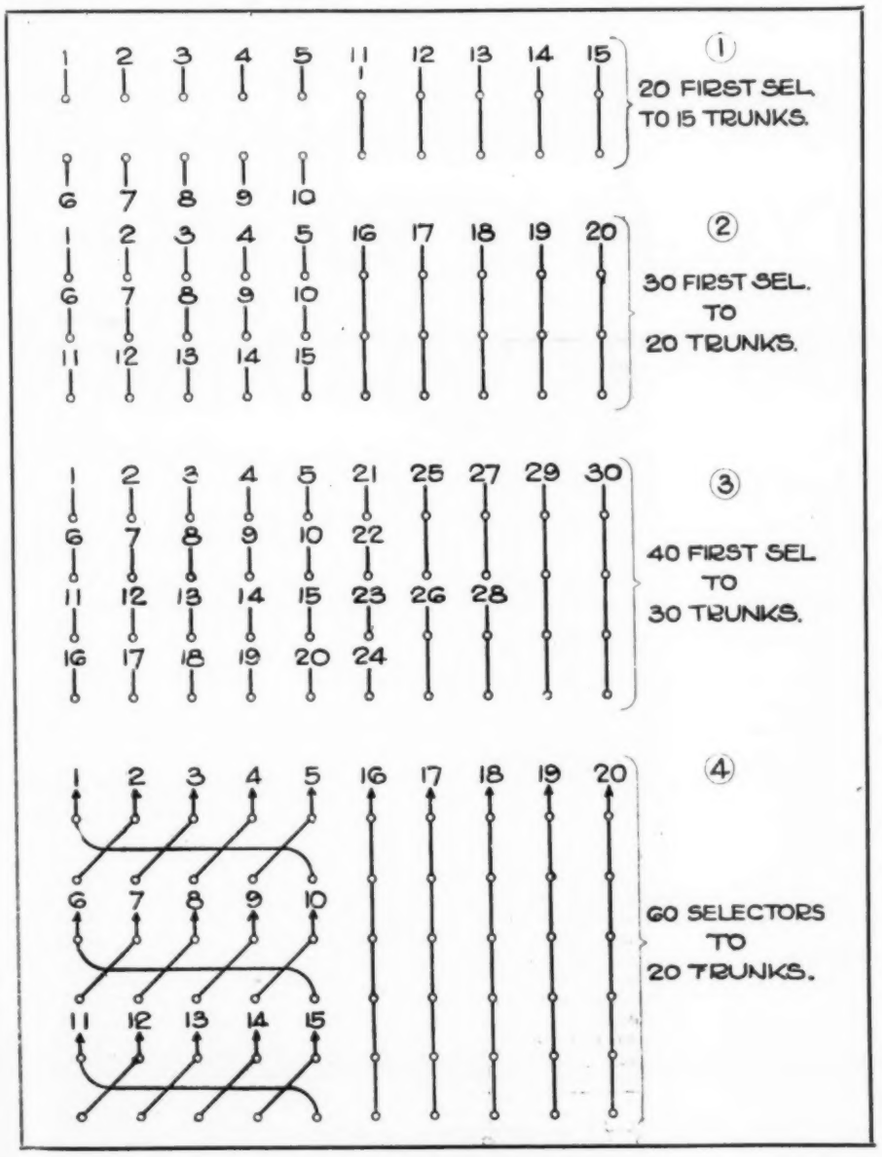

Fig. 2. Grouping of Selectors.

Assuming that the number of line switches is 5 per cent greater than the number of working lines, Table *D* indicates the proper grouping of plunger type line switches per master switch, for various calling rates and with a holding time of 120 seconds.

Ordinarily the average traffic would not be so great as to necessitate groups of less than 50 lines per master switch, except in unusual cases, such as where P.B.X. trunks or other busy flat-rate lines are grouped together. In this case, the lines of heavy traffic can be isolated and grouped 25 per master switch, thus reducing the average calling rate of the remaining lines.

First Selectors (Without Secondary Line Switches).

If local secondary line switches are not used, the number of first selectors would correspond to the number of equipped outlets from the primary line switches as explained in the previous paragraphs.

First Selectors (With Secondary Line Switches.)

When each of the ten trunks from each primary sub-group leads to a secondary line switch, which in turn has 10 outlets to first selectors, then each primary line switch will have access to 100 first selectors, and these 100 first selectors function as one group.

As explained in the following section, a

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group of 100 outlets reached through secondaries is not fully as efficient as if reached direct. The 100 first selectors may, however, be considered as having the effectiveness of a group of 85. If we consider that first selectors are sometimes held busy by line "shorts" or "grounds" or by subscribers unwittingly leaving their receivers down, it becomes necessary to allow for some margin, and this margin is obtained by using the 1 in 1,000 probability.

From Table *A* it can be determined that a group of 85 trunks will handle 59.4 *T C* (call hours) with a probability of loss of 1 in 1,000. Therefore, 100 first selectors reached through secondaries can be considered to carry safely 59.4 *T C*, and under certain conditions it has been considered that satisfactory service could be given on the basis of 100 first selectors carrying 75 *T C*. On the basis of 100 first selectors carrying 59.4 *T C*, the efficiency of the switches would be 59.4 per cent and the average occupancy per switch would be .594.

Local Secondary Line Switches.

Each of the ten trunks controlled by any primary master switch leads to a secondary line switch in a different secondary sub-group, each of which, in turn, has its own 10 outlets to first selectors. By reference to Fig. 3 it may be seen that any primary line switch may at different times take any one of 100 first selectors.

Since it is usually necessary to group from 18 to 25 primary sub-groups to 10 secondary sub-groups, and since from any one primary sub-group there is only one outlet to each secondary sub-group, it is evident that if the ten outlets from any secondary sub-group have been made busy by calls from ten primary sub-groups, the remaining primary sub-groups must be deprived of access to this secondary sub-group. Each of the remaining primary sub-groups will then only have nine available outlets. The general effect of this is somewhat to reduce the availability of the 100 first selectors. Experience has shown that good service can be given on the assumption that not more than 85 switches are ever in use simultaneously.

In order to minimize the difficulty of unavailable trunks from primary switches, it is necessary to distribute the traffic evenly among the secondary sub-groups, and the following three methods are practiced to contribute towards this end:

1. A special scheme of cross connection between primaries and secondaries so that whenever there is a tendency for the primaries to build up before a certain sub-group, the next call attempted will break up the combination.

2. The "step-off" relay on each secondary sub-group is so arranged that when this secondary sub-group has a pre-determined number of calls in progress on successive trunks, all of the primary switches which had pre-selected trunks to this secondary section are stepped off to another sub-group.

3. When a secondary sub-group has all trunks busy, all of the primary master switches associated with that entire secondary group are caused to operate momentarily. This aligns all of the disengaged primary line switches on the shaft, and re-groups the primary pre-selections.

If, from each primary sub-group, only eight outlets are equipped, even though 10 secondary sub-groups are used to carry the traffic to 100 first selectors, there would not be a theoretic group of 100 but rather 1¼ times a theoretic group of 80. However, there is so little difference between the two that a theoretic group of 100 can be considered as correct.

To compute the number of secondary line switches to a group of 10 sub-groups, we must first determine the number of primary sub-groups required to load the group. Consider that 100 first selectors reached through secondaries will handle 59.4 *T C*. The number of primary sub-groups to be placed in one group may be computed by dividing this by the average traffic offered per primary sub-group represented by *n T C* (*n* being the number of working lines in the primary sub-group, *C* being the number of calls per line, and *T* being the holding time in hours).

If the result is a mixed number, then only as many primary sub-groups should be grouped together as are represented by the whole number, unless it is known that there are margins in the original data which would permit using the next larger whole number. After this has been determined, the average occupancy of the first selectors should be determined on the basis of actual traffic handled, which will usually be somewhere near 59.4 *T C*.

Rotary Second Line Switches.

If rotary type secondaries are used, each group is made up of 10 sub-groups having 25 outlets, providing a theoretic group of 250 outlets or an effective group of 0.85 x 250 or 212.5. If a theoretic group of 250 is too large, by using less than 25 outlets, various smaller theoretic groups, such as 240, 220, or 200, may be obtained.

The number of primary sub-groups required to furnish traffic for a secondary group is determined much as in the case of plunger type secondaries. A theoretic group of 250 trunks or an effective group of 212.5 will handle 174. *T C* (call hours), hence from 50 to 60 primary sub-groups will be required to keep a group of rotary secondaries busy. Present practice in mounting the secondary line switches prohibits the placing of more than 50 primary sub-groups to a group.

Second Selectors.

From the traffic data we can obtain the percentage distribution of the originating calls, and thus determine the calls that are to be handled by second selectors.

A group of 10 trunks will handle 4.13 *T C* with a probability of loss of 1 in 100. Dividing the total number of call hours to be handled, by 4.13, will give the number of groups of 10 of second selectors.

When the first selectors are reached through secondary line switches, the resulting increase in efficiency is felt beyond the first selectors. In other words, 10 second selectors should carry more traffic than 4.13 *T C*.

Suppose in an office that had just sufficient traffic for 200 first selectors (*T C* = 2x59.4), that 70 per cent of the total traffic (83.16 *T C*) was local. Dividing this by 4.13 would indicate a need for slightly more than 200 second selectors. Obviously such a number of selectors is too high, since it would be more than the number of first selectors. Accordingly, some allowance can be made for the greater efficiency of second selectors when a relatively large percentage of the traffic is local.

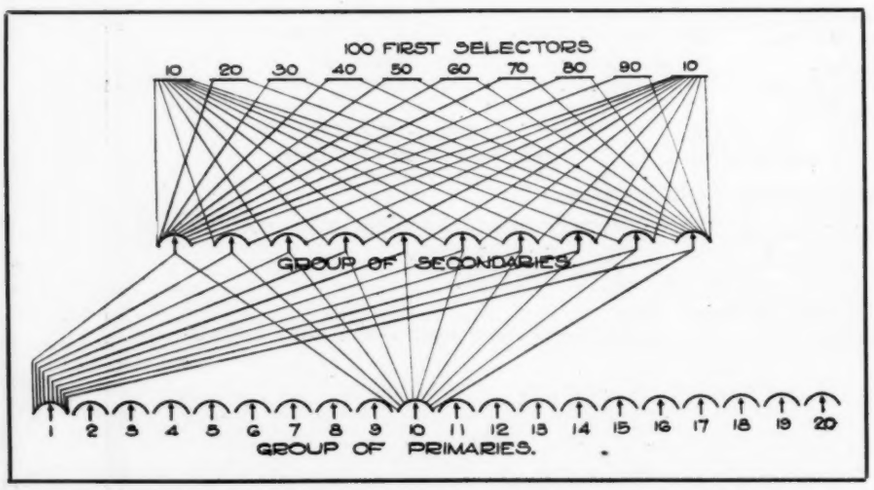

Fig. 3. Primary-Secondary and Secondary Selector Cross-Connecting Scheme.

It is also necessary to determine the method of multipling the first selector banks, because sometimes the number of second selectors must be adapted to the method of multipling. The preferred method is to determine the number of second selectors working in groups of ten, and then arrange the first selectors so that each group will have a number of second selector trunks individual, and the remainder common to two or more groups. For instance, 15 trunks from 20 first selectors may be so arranged that there will be five trunks individual to each group of 10 selectors and 5 trunks common to the entire 20. If the arrangement is such that the individual trunks are tested first, the entire group will handle 6.98 *T C* with a probability of loss of 1 in 100.

The other method is to determine the occupancy of the first selectors for the particular level under consideration, and group together a sufficient number of first selectors on the basis of this occupancy, to offer 4.13 *T C* to the second selectors. If the resultant number of first selectors is not a multiple of five, the number of first selectors is cut down and sufficient trunks are equipped to handle the traffic from such reduced group.

Trunks to Other Offices.

If the trunks are taken directly from selector levels, the number of trunks is determined in practically the same manner as the number of second selectors just described. Since the trunks operate through cable pairs to other offices, it is advisable to provide some margin to allow for trunks that may be unavailable because of cable conductors being in trouble. This margin is usually provided by using 1 to 1,000 probability instead of 1 in 100, or in other cases, by using the 1 in 100 table and adding a certain percentage to the resultant number of trunks.

If outgoing secondary line switches are used, the number of trunks in the group is determined from the 1 in 1,000 probability table, on the basis of the theoretic group being only 85 per cent available, as explained for first selectors. Either plunger type or rotary type line switches may be used for outgoing secondaries.

The number of trunks thus determined gives also the number of impulse repeaters required at the originating office, and the number of incoming second selectors in the distant office.

Outgoing Secondary Line Switches.

After the number of outgoing trunks has been determined, as just outlined, then the number of secondary sub-groups can be determined on the basis of a certain number of trunks per sub-group. If the number of sub-groups is less than 10, each ten trunk group must be divided as evenly as possible among all secondary sub-groups so that there will be more than one outlet for each trunk group, leading to each secondary sub-group.

This results in somewhat lowered efficiency, since if a certain secondary sub-group is momentarily or permanently busy, two or more outlets would be busy to the first selectors. In such cases, the 10 trunks are considered at only 85 per cent of their theoretic efficiency, and will handle .85 x 4.13 or 3.51 *T C*.

The number of outgoing secondary line

Fred L. Baer Is Sales Engineer of Automatic Electric Co.

switches can be determined on the basis of 10 outlets handling 4.13 *T C* or 3.51 *T C*, as the case may be, and then grouping the first selectors so that each group has a certain number of trunks individual to the group, and the remaining trunks common to two or more groups; or, as in the case of determining the number of second selectors, the occupancy of the first selectors for the particular level under consideration is determined and the first selectors arranged in groups so as to offer 4.13 *T C* or 3.51 *T C* per group. If the resultant number of first selectors is not a multiple of five, the number of first selectors is cut down and a sufficient number of outlets are equipped to care for the traffic offered by the reduced number of first selectors.

Third Selectors.

The third selectors in a five-digit system are used for distributing the calls to the various hundred groups in each thousand. Third selectors working in groups of ten can handle 4.13 *T C*. Accordingly, the number of groups of ten required for each thousand may be computed by dividing the total amount of traffic to be handled by each level, by 4.13 *T C*. The second selector banks should then be so multipled as to keep these groups of ten uniformly busy.

In case the scheme of multipling which is used is such that the local traffic is kept separate from the incoming traffic, because of the fact that the incoming switches may be reached through outgoing secondaries at the originating office, they will handle traffic at a different rate. Therefore, the occupancy per second selector for each level will have to be determined for both incoming and local switches, and the proper number of switches combined to supply ten trunks. The resultant grouping of second selectors should be in multiples of ten.

Connectors.

The number of connectors is computed by first determining the average calls terminating in each hundred and applying a percentage for variation as shown in Table *C*. Then if the traffic is less than 10 trunks will carry, we determine from the equivalent *T C* value the number of connectors from the second column of Table *A*.

If the number of calls is greater than 10 trunks will carry, then by dividing the number of calls by the number that 10 trunks will carry, the necessary number of groups of 10 may be found. The third selector multiple may then be arranged so there will be individual and common trunks. If this is not done, the number of connectors must be determined on the basis of full groups of 10 and a remaining partial group.

To take care of toll calls from toll selector banks, combination toll and regular connectors can be provided. These should be arranged so that they are the last choice for regular calls, so as to secure maximum availability for toll calls.

Rotary Connectors.

The method of determining the number of these connectors is the same as for regular connectors. Due to the fact that the calling rate to P.B.X. rotary groups is much heavier than to regular groups, and that the calling rate given is usually the result of observation of this particular class of calls, it is not necessary to add much, if any, percentage for variation.

Combination rotary connectors are, as a rule, rather complicated and there is, therefore, little economy in providing them. Accordingly, separate toll rotary connectors are provided and their number is computed in a similar manner as for local connectors.

Application.

It is believed that the principles just described will be better understood and made more interesting by a practical application. For this purpose we may consider a four-office network, and compute the amount of equipment needed in one of the offices to care for the assumed traffic.

Assume that the office under consideration has 6,000 working lines originating 10,692 *B.H.C.* (busy hour calls) of 120 seconds average duration, and assume, further, that this office is equipped with 6,300 line equipments and 7,000 connector

terminals. The distribution of traffic may be assumed as follows:

Local.	Outgoing.	Incoming.
A	4,277	.....
B	2,299	2,580
C	3,546	3,292
D	570	590

The assumptions for the traffic distribution to the thousands and hundreds groups are shown in Fig. 4. On the basis of these assumptions, the quantities of equipment may be computed by either of the two methods described.

Primary Line Switches.

Allowing 5 per cent of the number of primary line switches in excess of the number of working lines, to care for regrouping of lines and to equalize traffic, the 6,000 working lines would require 6,300 line switches, originating a total of 10,692 *B.H.C.* of averaged duration, 120 seconds.

The average calling rate per equipped line would be about 1.7 *B.H.C.* From Table *D*, which happens to have been worked out for calls at the 120-second holding time, we see that for a calling rate between 1.53 and 1.8 per line equipped, the line switches should be grouped 50 per master switch.

The 50 line switches will offer 85 *B.H.C.* Allowing for group variation of 37 per cent as indicated in Table *C*, we can expect that at times the group will offer traffic at the rate of 115 *B.H.C.* We find from Table *A* that 10 trunks will handle 4.13 *T C* or 124 *B.H.C.* at 120 seconds duration, with a probability of loss of 1 in 100. Therefore, the 6,300 line switches should be provided in 126 subgroups of 50.

First Selectors.

If the first selectors are reached through secondary line switches, each hundred first selectors will, as we have already seen, handle 59.4 *T C*, or 1,782 *B.H.C.* at 120 seconds duration. To handle 10,692 *B.H.C.* will, therefore, require six groups of 100 switches each, or 600 first selectors.

It will be seen that the traffic assumed would require a certain number of full groups. If, however, there were a partial group left over, then a smaller group, say of 50 or 60, or as may be required, would be provided.

Local Secondary Line Switches.

As previously explained, each hundred first selectors is fed by a group of secondaries consisting of 10 sub-groups. Since we have six major groups of secondaries, there will also be six major groups of primaries, each group consisting of 21 sub-groups of 50 switches each.

Since each sub-group of primaries has 10 outlets to secondary switches, there would be 210 secondary line switches in each secondary group; and since each secondary group has 10 sections, there would be 21 secondary line switches per sub-group. From this we may see that there would be a total of 6x10x21 = 1,260 secondary line switches and 6x10 = 60 secondary master switches.

Local Second Selectors.

From Fig. 4 we see that the local traffic consists of 4,277 *B.H.C.* Since 10 outlets will handle 4.13 *T C*, or 124 *B.H.C.* of 120 seconds duration, to handle the local traffic will require 34½ groups of 10 or 345 local second selectors, a trial

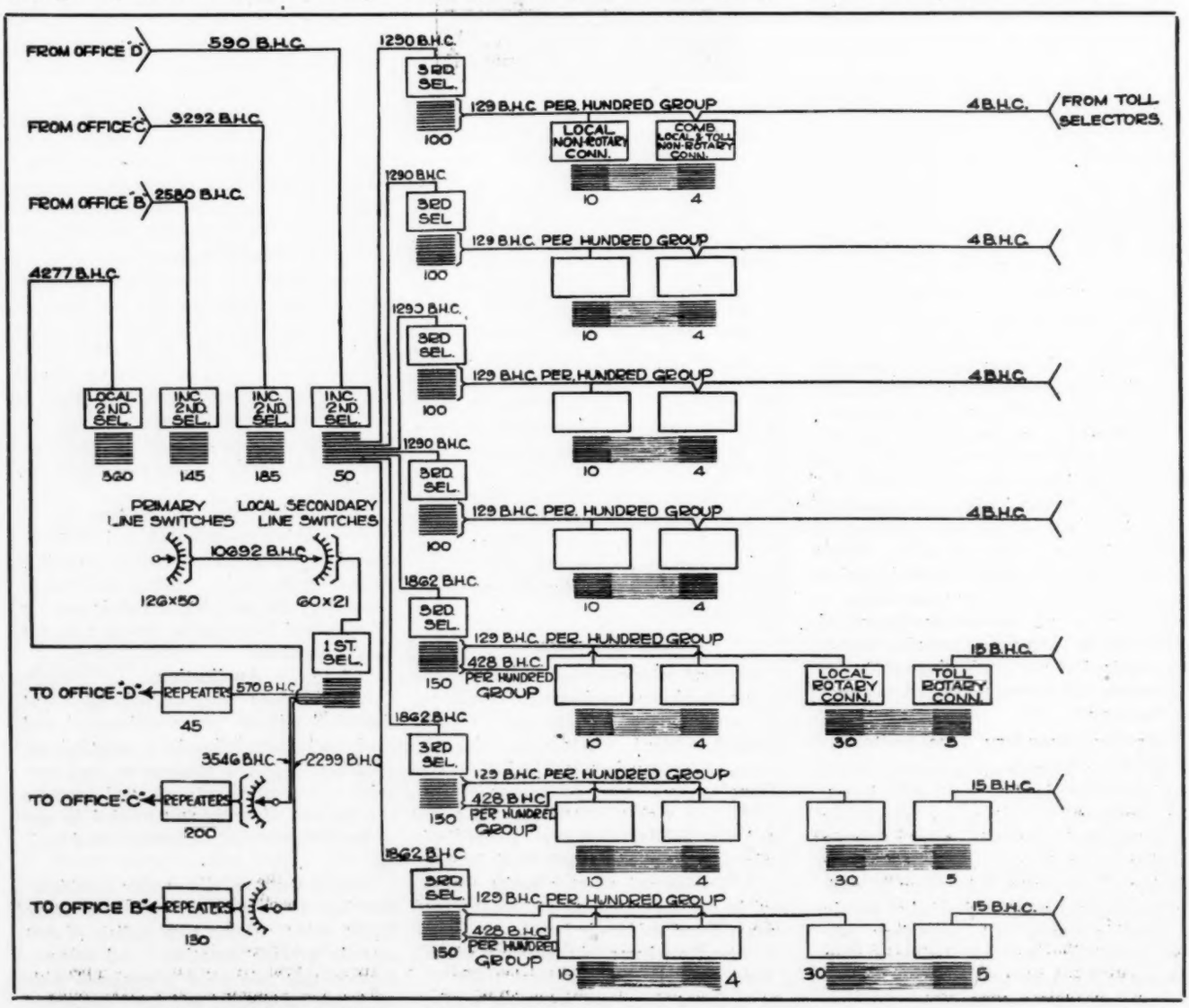

Fig. 4. Schematic Diagram Showing Distribution of Calls and Quantities of Equipment.

grouping showing that 360 local second selectors should be provided.

Using the multipling scheme, as shown in Fig. 2, for the second level of first selectors, we see that for each 10 first selectors, the first five contacts have access to five individual trunks, and the last five contacts have access to five common trunks shared with 50 other switches. This grouping would provide 60 groups of five individual trunks, and 12 groups of five common trunks, or a total of 360.

It should be noted from Table *B* that the carrying capacity of the 60 groups of individual trunks is 60x2.85 or 171 *T C*, and that of the 12 groups of common trunks of 12x1.28 or 15.36, or a total of 186.36 *T C*, which represents 5,590 *B.H.C.* of 120 seconds duration. This arrangement of multipling provides, in this case, for an increase of approximately 30 per cent above the normal local traffic.

Outgoing Trunks to Office "B."

The 2,299 *B.H.C.* representing the outgoing traffic to Office *B* is equivalent to 76.6 *T C* at 120 seconds duration. Since 100 trunks will handle 59.4 *T C*, 1.28 groups of 100, or 130 trunks, will be needed to handle this traffic. It will be noted that this was computed on the basis of a probability of loss of 1 in 1,000. We might have made the computation on the basis of loss of 1 in 100, which would have indicated a need for 118 trunks. Adding 10 per cent to this result to allow for trunks being unavailable due to conductor trouble, would give the same result as before, namely, 130 trunks. The number of trunks incoming at Office *B* from Office *A* will also be 130.

Since the outlets from the first selectors to the outgoing secondary line switches will be in groups of 10, and since 10 trunks will handle 124 *B.H.C.* of 120 seconds duration, we would, therefore, need 18.5 groups of 10, or 185 outgoing secondaries. To facilitate grouping and to provide additional margin, we could profitably install 200. The 600 first selectors could be grouped on the basis of 30 first selectors to 10 outgoing secondaries; or, if desired, we could arrange 60 first selectors to 20 outgoing secondaries, by means of 3 individual groups of 5 and 1 common group of 5. The latter arrangement would provide a margin of nearly 30 per cent to care for emergencies.

Outgoing Trunks to Office "C."

The 3,546 *B.H.C.* of 120 seconds duration, representing the outgoing traffic to Office *C* is equivalent to 118.15 *T.C.* This would require 1.99 groups of 100 or, say, 200 trunks.

The number of outlets from the first selectors to the outgoing secondary line switches = 3,546/124 or 28.6 groups of 10 outgoing secondaries. It would probably be more convenient to provide 300. These would be arranged on the basis of six individual groups of four and one common group of six for each 60 selectors, providing about 16 per cent margin.

Outgoing Trunks to Office "D."

The 570 *B.H.C.* representing the outgoing traffic to Office *D* would be carried direct to outgoing trunks, and not through secondaries. The number of trunks must, therefore, be computed as working in groups of ten, giving 570/124 or 4.5 groups or 45 trunks. These could be arranged in six individual groups of five and three common groups of five, or total of 45 trunks. This arrangement would provide a margin of nearly 10 per cent for emergencies.

Incoming Second Selectors from Office "B."

Assuming that the outgoing trunks at Office *B* are reached through secondaries, the 2,580 *B.H.C.* would indicate a need of 145 trunks computed as above.

Incoming Second Selectors from Office "C."

Assuming that the outgoing trunks at Office *C* are reached through secondaries, a need of 185 trunks would be indicated.

Incoming Second Selectors from Office "B."

The 590 *B.H.C.* originated by Office *D* would be carried direct to outgoing trunks. Working in groups of ten, 50 trunks would be needed.

Third Selectors.

For each of the 1, 2 and 3 thousand groups it is assumed there will be 1,862 *B.H.C.* This means that from the local and incoming second selectors to third selectors, we would need 1,862/124 = 15 groups of ten, or 150 trunks for each of the first three levels.

The detail arrangement of the multiple is too tedious to describe here; suffice it to say that consideration is given to the fact that the local and incoming selectors are handling calls at different rates on account of some being fed through secondaries.

For each of the 4, 5, 6 and 7 thousand groups it is assumed there will be 1,290 *B.H.C.* Each of these four levels must, therefore, provide 1,290/124 = 10 groups of ten or 100 trunks to third selectors.

Connectors.

For each of the regular hundreds it is assumed that there will be 129 *B.H.C.* of 120 seconds duration and 4 toll calls of 240 seconds duration. The total traffic would then be 4.3 *T C* + 0.266 *T C* = 4.566 *T C*. Allowing for a group variation of 25 per cent as shown in Table *C*, we must provide facilities for handling 5.7 *T C*. We should, therefore, need 1.38 groups of ten or 14 connectors, four of which could be combination connectors and the remainder regular connectors.

The combination connectors are used for incoming toll calls and are last choice for regular calls. Five individual trunks would be taken off the first contact, one trunk from each of five divisions of third selectors, five trunks would be taken off the next five contacts which would be multipled throughout all switches, and four trunks would be taken off the last four contacts in such a manner that the trunks from these contacts would seldom be used and would be almost continuously available for toll. This arrangement of trunks will provide for nearly 15 per cent increase over the variation allowed above.

Rotary Connectors.

For each of the P. B. X. hundreds, it is assumed that there will be 428 *B.H.C.* of 120 seconds duration. This is equivalent to 14.3 *T C* and would require 34 connectors. Since this calling rate is very heavy and is established from traffic for a comparatively small group of lines, no group variation need be allowed. By arranging five individual groups of five, and a common group of five, or a total of 30 connectors, we could handle 15.53 *T C*, which would be nearly 9 per cent above the average traffic.

Assuming that there are 15 *B.H.C.* of 240 seconds duration from toll, and allowing for a 25 per cent variation, the traffic would be represented by 1.25 *T C* requiring five toll rotary connectors.

Second Method.

In computing the number of primary line switches, local secondary line switches and first selectors, there may be slight differences in detail, but the final result is nearly the same whatever method is practiced.

Local Second Selectors.

The average occupancy per first selector with respect to all calls is 59.4/100 = 0.594. The average occupancy with respect to the second level for local calls is 4,277/10,692 × 0.594 = 0.238. Since 10 outlets will handle 4.13 *T C*, the number of first selectors required to feed 10 trunks would be 4.13/.238 or approximately 18. Since this is not a multiple of five, and since it is reasonable to suppose that 20 first selectors would overload the group, it is necessary to drop back, say, to 15 selectors. This number, we find, would offer 3.57 *T C*, which could be handled by nine trunks. We would, therefore, provide 600/15 or 40 groups of nine; a total of 360 local second selectors. These would be wired with banks and shelves for 40 groups of 10. If, however, it was unlikely that the tenth trunk would ever be utilized, the multipling scheme outlined in the first method would be preferable.

Outgoing Trunks to Office "B."

The number of outgoing trunks would not differ in applying the second method, but the number of associated outgoing secondary line switches could show some difference.

The average occupancy of the first selectors with respect to the third level would be 2,299/10,692 × 0.594 = 0.128 *T C*. Since 10 outlets will handle 4.13 *T C*, it will require 4.13/.136 or 32 first selectors to feed each group of ten outgoing second-

ary line switches. Arranging the first selectors in groups of 30, would give 20 groups, providing a total of 20×10 or 200 trunks to secondaries.

Outgoing Trunks to Office "C."

The average occupancy of the first selectors with respect to the fourth level would be 3,546/10,692×0.593 = 0.197 *T C*. Since 10 outlets will handle 4.13 *T. C*, it will require 4.13/.197, or 21 first selectors to feed each group of ten outgoing secondary line switches. Arranging the first selectors in groups of 20 for this level would provide 30 groups of 10, or 300 outgoing secondaries for this office.

Outgoing Trunks to Office "D."

The average occupancy of the first selectors with respect to the fifth level would be 570/10,692×0.594 = 0.0317 *T C*. Since 10 outlets will handle 4.13 *T C*, it will require 4.13/.0317 or 130 first selectors to feed each group of 10 trunks. There would be four full groups of 130 and a partial group of 80. This partial group will offer 80×.0317 or 2.536 *T C*, which would require eight trunks. There would, therefore, be a total of 48 trunks needed to Office *D*.

Incoming Second Selectors.

These can be computed in the same way as described in the first method.

Third Selectors.

It has been found that each group of nine local second selectors will handle 3.57 *T C*. From this it can be seen that the average occupancy with respect to each of the first three levels is 748/4,280 ×3.57/9 = 0.0694 *T C*.

Since 10 outlets will handle 4.13 *T C*, there will be required 4.13/.0694 or 60 local second selectors to each group of 10 trunks. Since the local second selectors are mounted in divisions of nine, each group must contain either 54 or 63 switches. If they are arranged in groups of 63, there would be five full groups, and a partial group of 45, which partial group would require nine trunks. There would, therefore, be 59 third selectors from each of the 1, 2 and 3 levels of local second selectors.

The occupancy of the local second selectors with respect to each of the 4, 5, 6 and 7 levels, would be 510/4,280× 3.57/9 or .0473 *T C*. For each group of ten trunks, there would, therefore, be needed 4.13/.0473 = 87 local second selectors. The total number of local second selectors would, therefore, be divided into four groups with respect to these levels, thus feeding into 40 third selectors.

Since the average occupancy of the incoming second selectors from Office *B* is 0.594, the occupancy with respect to each of the 1, 2 and 3 levels is 436/2,580×0.594 or 0.1 *T C*. There would thus be required 4.13/.1 or 41 switches to each group of 10 trunks.

These switches may be arranged in three full groups of 40, and a partial group of 25, which partial group may be combined with switches from Office *C*. Since the occupancy of selectors with respect to each of the 4, 5, 6 and 7 levels is 318/2,580×0.594, or 0.0732 *T C*, it would require 4.13/.0732 or 56 switches to each group of ten trunks, with respect to these levels. They may be thus arranged in two full groups of 50 and a partial group of 45.

Since the average occupancy of the incoming second selectors from Office *C* is 0.594, the occupancy with respect to each of the 1, 2 and 3 levels is 588/3,292×0.594 or 0.109 *T C*. It would, therefore, require 4.13/.109 or 40 switches to each group of 10 trunks.

By arranging for four full groups of 40 and combining 15 more with the partial group of 25 from Office *B*, a partial group of 10 would be left, which may be combined with the group from Office *D*. The occupancy of these incoming selectors with respect to each of the 4, 5, 6 and 7 levels would be 382/3,292×0.594 or 0.069 *T C*, requiring 4.13/.069 or 60 switches to each group of 10 trunks. These may be arranged in three full groups of 60, and a partial group of five, which may be combined with the incoming selectors from Office *D*.

Since the average occupancy of the incoming second selectors from Office *D* is 0.413, the occupancy with respect to each of the 1, 2 and 3 levels is 90/590×0.413 or 0.063 *T C*, and the 50 incoming selectors would offer 3.15 *T C*. Combining this group with the partial group of 10 from Office *C* would make a full group of 60 offering 4.13 *T C*.

Since the occupancy of these selectors with respect to each of the 4, 5, 6 and 7 levels would be 70/590×0.413 or 0.049, the 50 incoming selectors would offer 2.45 *T C*. The partial group of five from Office *C* would offer 5×0.069 or 0.345 *T C*, and if this is combined with the group from Office *D*, the entire group would offer 2.795 *T C*, requiring eight trunks to third selectors.

We, therefore, have in each of the first three thousands the sum of 59, 30, 40, 10 and 10, or 149 third selectors. We have in each of the remaining four thousands the sum of 40, 30, 30 and 8, or 108 third selectors.

Connectors.

For each of the regular hundreds, with 129 *B.H.C.*, it might be unsafe to provide only 10 connectors, so that the third selectors should be arranged in one full group, and a very small partial group. This partial group could be combined with the toll selectors, and the trunks led to four combination connectors. This arrangement would provide a group of 10 trunks and a group of 4 trunks, with capacity to carry 4.953 *T C* or about an increase of 8 per cent over the estimated average.

For 428 *B.H.C.* of 120 seconds duration, or 14.3 *T C*, there would be required three groups of 10 trunks to carry 12.39 *T C*, and a partial group of seven trunks to carry the remaining 1.91 *T C*, making a total of 37 rotary connectors.

To avoid the tedious computation of the occupancies of the various groups of third selectors it has, in this case, been assumed that the third selectors could be arranged so that the respective groups of 10 trunks would each have the rated capacity. Since there are less than 10 toll rotary connectors, they could be computed as indicated in the first method.

Summary.

In the first method the number of trunks is determined on the basis of independent groups of ten, but the resultant number of switches is so arranged by means of overlapping multiples or common groups of trunks as to afford teamwork between groups.

This extra call handling capacity is used as a margin to care for possible peak and emergency traffic. This is essential if, as in this case, the busy-hour originating traffic is the basis of distribution, since the peak traffic in any given direction may not coincide with the peak for the originating traffic.

In the second method, each group of trunks is independent of all other groups and is accessible only from a fixed field. There is no teamwork; each group must be arranged to care for its own peak.

The table below gives a summary of the results obtained in this case by both methods.

	1st Method.		2nd Method.	
	Number.	Remarks. Margin.	Number.	Remarks. Margin.
Primary line switches	6300	....	6300	....
Secondary line switches	1260	....	1260	....
First selectors.	600	....	600	....
Local second selectors	360	30%	360	....
Outgoing sec. L. S. to B...	200	30%	200	....
Repeaters to B.	130	10%	130	10%
Outgoing sec. L. S. to C...	300	16%	300	....
Repeaters to C.	200	10%	200	10%
Repeaters to D.	45	10%	48	....
Incoming 2nd sel. B.....	145	....	145	....
Incoming 2nd sel. C.....	185	....	185	....
Incoming 2nd sel. D.....	50	....	50	....
Third selectors.	850	....	879	....
Non-rotary connectors	640	15%	640	8%
Combinations connectors ..	256	15%	256	8%
Rotary connectors	180	9%	222	....
Toll rotary connectors ..	30	....	30	....

For the items where no margain is indicated, there is no allowance above that provided in the group variation or probability table. The results arrived at by the first method as shown in the table would save an initial investment of ap-

proximately $4,000, at the same time providing an allowance for emergencies by the use of overlapping multiples.

While the preceding example did not cover the calculations for toll switches and special services to desks, it is felt that the general principles here described can be applied in computing such details of this or any other network.

The author desires to acknowledge the assistance rendered by H. E. Clapham, technical editor of "Automatic Telephones," in the preparation of this paper.

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Commissions, Courts and Councils

Discussions and Rulings of State Bodies Having Supervision Over Telephone Companies—Decisions of Courts in Matters of Interest to Public Utilities and Actions of City Councils Relative to Franchise, Rates and Service.

Federal Judge Restrains City from Enforcing Confiscatory Rates.

A temporary injunction recently granted the Dallas Telephone Co., Dallas, Texas, by Judge Jas. C. Wilson of the United States District Court for Northern Texas, gave the telephone company the right to put into effect the first of December a new schedule of rates. The new rate for single line business service will be $10 per month and $4 per month for the same class of service for residence.

At the same time the new rates went into effect, the company instituted a new service for the city of Dallas. This was a two-party line service for $3.50 per month for residences and $8.50 per month for two-party line business service. Unlimited service will be given over each.

The telephone company applied for an increase in rates in the city of Dallas sometime prior to October 1, 1920, at which time the rates granted in 1918, when the two plants were consolidated, expired. The company was bound by the consolidation ordinance to furnish service at the old rates until October 1, 1920. In the controversy that followed, the city virtually agreed to grant the company authority to charge $7.50 for business telephones and $3 per month for residence telephones. The company contended that it could not continue to operate on the rates offered as a compromise by the city.

The text of the opinion of Judge Wilson is as follows:

"The city of Dallas will be enjoined from interfering with the charging and collection by the company of its proposed rates; the basic rates being $10 for business and $4 for the residence telephones.

The court is not deciding that this is a fair or reasonable rate; that is not the purpose of this hearing, nor can it be the purpose of a final hearing. This court has no such power. It can only decide that rates and charges below a certain level will be unfair and confiscatory and prohibited under the franchise and the constitution.

The court is only deciding here that the present rate of $5 and $2 is confiscatory; that irreparable loss and injury will result to the company if continued, and that the city of Dallas has refused, or failed, to comply with its obligation in the franchise, namely, to determine forthwith after October 1, 1920, the rates which the company may thereafter charge, and that, therefore, the company has the right during the time the city takes to consider this rate question, to put into effect and collect from its patrons its proposed rates and to deal with its patrons independent of the city's rate-making power, the same as any business concern not government-controlled, deals with its customers.

However, since the company, even in the present emergency under the franchise, is limited to a rate that will produce a reasonable return upon a fair valuation of its property and can not lawfully go higher, and since the court is not passing upon the reasonableness of the proposed rate in this respect, a bond will be required of the company for the protection of the city and each of the company's subscribers.

The condition of the bond will be that, in the event it is finally determined as a result of this proceeding that a lower rate than $10 and $4 would be reasonable, the company pay back to the city and to each of its subscribers the pro rata share of any such difference. The amount of the bond will be determined by estimating the difference for one year between the gross revenues produced by the $10 and $4 rate proposed by the company and the $7.50 and $3 rate which was in effect stated by the city in its letter of September 23, to be a fair and reasonable rate.

This court would have it distinctly understood by the parties that it is not the power or purpose of the court in granting this injunction to restrain or in any way limit the city of Dallas in the exercise of its legislative power delegated to it by the state to regulate telephone rates. If it is now engaged, as contended, in the legislative process of making or regulating telephone rates that may be charged by the company, it may proceed with such rate regulation and regulate or fix such rates, the same after as before this injunction."

Rates Increased in Vicinity of Cerro Gordo and LaPlace, Ill.

The Illinois Public Utilities Commission, in a ruling handed down recently, authorized the Cerro Gordo Telephone Co. to increase its rates for telephone service in Cerro Gordo, LaPlace, and vicinity. If, upon further investigation by the commission, the new rates are found to be excessive, the company is to make refund of any such excess, plus interest at 6 per cent per annum. The old and new annual rates at the two exchanges are:

Cerro Gordo.	Old.	New.
Individual, business	$24	$33
Two-party, business	21	27

Individual, residence	18	24
Two-party line, residence	15	..
Four-party, residence		21
Rural party, residence	21	24
Four-party rural, business	..	33
La Place.		
Individual, business	21	30
Two-party, business	..	27
Individual, residence	18	21
Two-party, residence	15	..
Four-party, residence	..	18
Rural party, residence	21	24
Four-party rural, business	..	30

A discount of 25 cents per month applies to the rates for business and rural telephones, exclusive of extension telephones, if payment is made monthly at the office of the company on or before the 15th day of the current month.

Where service of a subscriber is discontinued for one month or more and the telephone number is retained during absence on vacation, one-half the regular rental shall be charged during such period, provided written notice is given to the company in advance of the temporary discontinuance of service.

Minimum Present Value of Chicago Company's Properties.

Minimum present value at the Chicago Telephone Co.'s properties in Illinois, constituting approximately 98 per cent of its properties, as submitted to the Illinois Public Utilities commission are as follows: Land, $1,665,109; buildings, $13,297,960; plant, $64,477,865; general equipment, $1,722,703; construction, $474,318, working capital, $2,000,000; preliminary, engineering and administrative costs and interest during construction, $15,479,376; going value $15,362,000. Total minimum present value, $177,779,931.

Kansas Industrial Court Sets Wage Scale for Telephone Co.

The Kansas Court of Industrial Relations has granted wage increases to operators and linemen employed by the Crawford Telephone Co., of Girard, Kans. The order affects the company's employes at Girard, Arma and Cherokee.

The new wage scale is for a minimum of $8 a week for operators, with $10 scale after the first month, $12.50 after six months and $15 a week after the first year of service. Linemen are to receive a minimum of $14 a week during the first three months, $16 a week during the second three months period, $18 a week during the second six months period and $24 a week after the first year.

Charged Same Rate for Individual and Party Line Service.

The Minnesota Railroad & Warehouse Commission issued an order on November 26, granting permission to the Cannon Falls Telephone Co. to increase its local and rural telephone rates and to establish service connection and miscellaneous charges at Cannon Falls. Effective December 1, the monthly rates are as follows:

Individual line business	$2.75
Two-party line business	2.25
Individual line residence	1.75
Four-party line residence	1.25
Rural multi-party	1.50
Rural multi-party, business (exclusive)	3.25
Business and residence extension (net)	.50
Extension bells (net)	.25

Individual line residence, outside exchange area, individual line rate, plus 25 cents additional for each quarter mile or fraction thereof.

Temporary disconnections at one-half the regular rate for any class of service.

A discount of 25 cents per month will be allowed on all local gross rates, if paid on or before the 20th of the month in which the service is rendered.

Rural rates are payable quarterly, with discounts of 75 cents, 50 cents, and 25 cents, if paid on or before the 20th of the first, second or third month of the quarter.

Here are the service connection charges allowed:

SERVICE CONNECTION CHARGES.

	Business Stations	Residence Stations	Extensions
Instrument not in place	$2.00	$1.50	$1.00
Instrument in place	1.50	1.00	No charge

Charges for moves and changes in directory listings are the same as those allowed other Minnesota companies with like connection charges.

The Cannon Falls Telephone Co. is a co-partnership, organized in 1900, and now serves approximately 317 town and 447 rural stations. It also operates toll lines between Cannon Falls and Northfield. The town subscribers are served by metallic circuits and a majority of the rural subscribers on grounded circuits. On account of electric current interference, it was necessary to make a number of the rural lines metallic.

In the past, the company furnished service at discriminatory rates, in that the same rate was charged for individual and party line service. The new rates eliminate this discrimination.

Minnesota Company Increases Rates for Telephone Service.

The Minnesota Railroad & Warehouse Commission issued an order on November 23, authorizing the Alvarado Telephone Co., of Alvarado, to increase its rates. The old rates and the rates authorized compare as follows:

	Per month. Old.	New.
Individual line business	$1.25	$2.25
Individual line residence	1.00	1.50
Rural multi-party	1.00	....
Rural multi-party, metallic circuit	....	1.75
Rural multi-party, grounded circuit	....	1.50
Rural switching charges (net)	.25	.35

All rates to be billed gross except where quoted net.

Rural switching payable yearly in advance.

A discount of 25 cents per month is allowed on all local gross rates if paid on or before the 15th day of the month in which the service is rendered.

Rural rates are payable quarterly, with discounts of 75 cents, 50 cents, and 25 cents, if paid on or before the 15th day of the first, second or third months of the quarter in which the service is rendered.

In its application the company asked for a rate of 50 cents for switching service. The commission denied this charge and authorized a rate of 35 cents per month, pending an investigation by the commission as to the actual cost of rendering such service.

The Alvarado Telephone Co., a corporation, operates approximately 122 town and rural stations and performs switching service for 39 rural connecting line stations.

Increased Rates and Depreciation Reserve for Nebraska Company.

Increased telephone rates for the Arcadia Electric Light & Telephone Co., of Arcadia, were allowed by the Nebraska State Railway Commission on December 1. The new rates become effective December 6 and are to remain in effect for a period of six months, subject to further order at the end of that time. The new monthly rates are: Business $2; residence $1.25 and $1.15; farm $1.25; and switching $5 per year.

J. L. White, owner of the company, was ordered to set aside $200 per month to provide for a depreciation reserve. In its opinion the commission says that the accounts of the telephone and electric light plants have not been properly segregated from one another, and directs that this be done in the future.

New Rates Filed by Delhi (N. Y.) Telephone Co.

Under a tariff filed December 6 with the New York Public Service Commission, the Delhi Telephone Co., serving Delhi and six towns in Delaware county, will establish the following annual rates for telephone service on and after January 1:

Individual line business	$48
Individual line residence	30
Four-party line business	36
Four-party line residence	24
Rural line business, metallic circuit	33
Rural line business, grounded circuit	24
Rural line residence, metallic circuit	24
Rural line residence, grounded circuit	21
Extension stations, business	12
Extension stations, residence	6

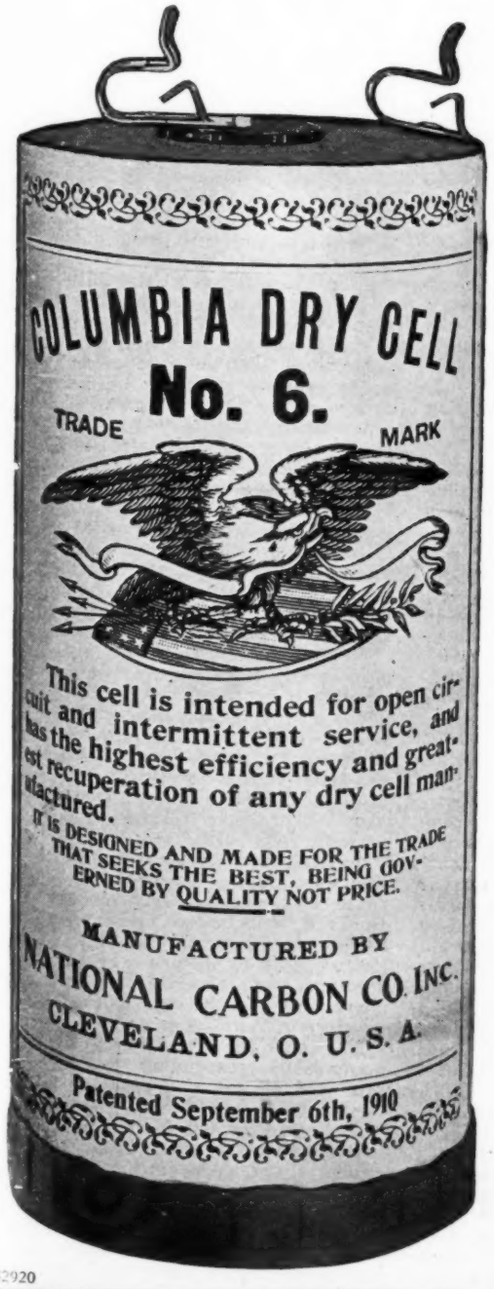
Two-party line service is discontinued under the new tariff and a four-party line business service established.

Coloma (Wis.) Telephone Co. Increases Switching Charge.

In an order issued December 2, the Wisconsin Railroad Commission authorized the Coloma Telephone Co. to in-

Columbia Telephone Cell

"less cost per day of service"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crease its rates, effective January 1, 1921, from its old rates of $13 per annum, if paid a year in advance, or $1.25 per month, if paid by the month, to $15 per year if paid in advance during the first quarter, $16 per year if paid within the second quarter, $17 per year if paid within the third quarter, and $18 per year if paid within the fourth quarter, or $1.40 per month if paid by the month.

The company was organized about 1906 and has since that time been rendering service to the public in and around the southwestern part of Waushara county. One exchange is located in the village of Coloma, to which are attached 292 subscribers according to the company's 1919 report. A small exchange is maintained at Richford which serves 61 subscribers. The two exchanges afford service to about 353 subscribers. The subscribers of these two exchanges have unlimited service with each other and also reach without any toll charges the subscribers of the Westfield Telephone Co. and the Marquette & Adams County Telephone Co. All the subscribers' circuits are grounded and about 10 or 11 lines have more than 12 subscribers per circuit.

Small Wisconsin Company Allowed Higher Rates.

On November 22, the Wisconsin Railroad Commission authorized the Pacific & Wyocena Telephone Co. to increase its annual rates for service effective December 1, 1920, as follows:

	Old. Per Year.	New. Year.
Single party line in Wyocena.	$12	$14
Party line service	10	12

The order further provides that the company shall maintain all instruments and rural lines and that the maintenance costs shall be paid for directly by the company.

The company furnishes service to approximately 160 subscribers in the village of Wyocena and the surrounding rural territory. The physical property consists chiefly of a 100-drop magneto switchboard with 34 local grounded circuits and 11 rural grounded circuits, consisting of 110 miles of wire and 60 miles of pole line. The book value of the property and plant was reported at $4,350.90.

Wisconsin Company Increases Rates in Marquette County.

Authority was granted the Oxford & New Haven Telephone Co. on November 30, by the Wisconsin Railroad Commission to increase its rates for service rendered on and after January 1, 1921, from its old rate of $10 per year to $12 per telephone per year, applicable to stockholders and non-stockholders alike.

The company operates a telephone system in the territory surrounding Endeavor in Marquette county. It owns only the wire plant and substation equipment and secures switching service from the Marquette County Telephone Co. for its 67 subscribers. The value of the company's property and plant is approximately $2,400.

Summary of Commission Rulings and Schedule of Hearings.

ARKANSAS.

December 13: Hearing at Little Rock on application of the Southwestern Bell Telephone Co. for authority to increase rates in Fort Smith postponed from December 1 to this date.

FLORIDA.

December 8: Hearing at Dunnellon on application of the East Florida Telephone Co. for authority to increase rates in Dunnelon.

ILLINOIS.

November 22: Order issued permanently vacating and setting aside suspension and resuspension orders covering rates for telephone service by the Farina Mutual Telephone Co., of Farina, and permitting the company to increase rates December 1, 1920, also requiring the company to set aside $19 monthly to provide for a depreciation reserve. No. 10331.

November 22: Order issued permanently setting aside suspension and resuspension orders covering the rates for telephone service by the Chesterfield Telephone Co. in Medora, and permitting the company to increase rates December 1. The installation and move charges asked for in the application are suspended, pending further order. The company was also required to set aside $78.17 monthly to provide for a depreciation reserve. No. 9941.

November 22: Order issued suspending until March 30, 1921, proposed advance in rates for telephone service by the DePue Telephone Co., of DePue. No. 11095.

November 22: Order issued suspending until April 10, 1921, proposed advance in rates for telephone service by the Danvers Telephone Co., of Danvers. No. 11110.

November 22: Order issued suspending until March 28 proposed advance in rates for telephone service by the Buckley Telephone Co., of Buckley. No. 11091.

November 22: Order issued resuspending until May 22, 1921, proposed advance in rates for the Citizens Telephone Co. for telephone service in Lawrenceville, Sumner, Bridgeport, and St. Francisville. No. 10738.

November 22: Order issued authorizing the Rosiclare Telephone Co. to purchase certain telephone property owned by T. H. Johnson, of Rosiclare; requiring Mr. Johnson to turn over all books of accounts, and to make report of operations, etc.; also requiring that no local or toll rates shall be changed without approval by the commission. The company was granted a certificate of convenience and necessity, permitting it to operate a telephone system in Rosiclare and was authorized to issue $1,500 capital stock, the proceeds of which are to be applied to the purchase of the property. No. 10791.

November 22: Order issued authorizing the National Telephone & Electric Co. to purchase telephone property owned by the Waynesville Farmers Telephone Co., of Waynesville, for $1,700, said transfer to be effected within 20 days. The order directs the Waynesville company to turn over all books of accounts and make report of telephone operations; also directs that rates shall be identical in annual amounts and classification to the rates now in effect. No. 10972.

November 22: Orders issued vacating and setting aside suspension orders affecting rates for telephone service by the Virden Home Telephone Co., of Virden, and the Tamaroa Telephone Co., of Tamaroa, and permitting the new rates to become effective December 1. The Virden Home company was ordered to set aside $340 monthly and the Tamaroa company $19 monthly to provide for depreciation reserve. Nos. 10715 and 10533.

November 22: Order issued permanently vacating and setting aside suspension order affecting rate schedule IPUC 2, covering telephone service by the Sparland Telephone Co. in Sparland, and permitting the proposed schedule to become effective December 1; also requiring the company to set aside $73.50 monthly to provide for a depreciation reserve.

November 22: Provisional order issued permanently vacating and setting aside suspension and resuspension orders affecting rates for telephone service by the Central Union Telephone Co. in Centralia, Central City, and Womac, and permitting the company to establish new rates December 1. If, upon further investigation, the new rates are found to be excessive, the company is to make refund of any such excess. No. 10423.

November 22: Order issued permanently vacating and setting aside suspension order affecting rates for telephone service by the Sullivan Home Telephone Co. in Sullivan, and permitting the company to increase rates December 1; also requiring the company to set aside $310 monthly to provide for a reserve against depreciation. No. 10963.

November 22: Dismissal order issued dismissing without prejudice citation order approved October 18, 1920, in re failure of the Troy Telephone Co. to file schedule of rates and charges for telephone service as authorized in case No. 9579, April 6, 1920, it being found that the schedules have been filed as per order.

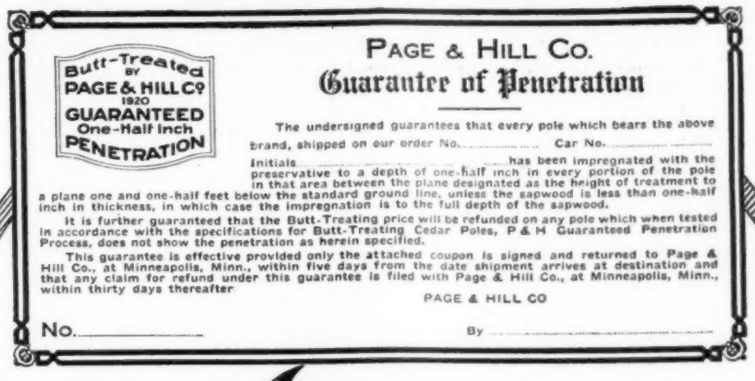
November 22: Order issued dismissing without prejudice citation order approved October 18, 1920, in re failure of the Home Telephone Co. to file schedule of rates and charges for telephone service as authorized April 6, 1920, it being found that said schedule had been filed.

November 22: Provisional order issued permanently vacating and setting aside suspension order affecting rates for telephone service by the Pittsfield Telephone Exchange in Pittsfield, and permitting the company to increase rates December 1. If, upon further investigation, the new rates are found to be excessive, the company is to make refund of any such amount. No. 10788.

November 22: Order issued authorizing the Scott County Telephone Co. to purchase telephone property owned by the Bluffs & Winchester Telephone Co. for $3,000, and requiring the Bluffs & Winchester company to turn over all books of accounts, etc., also directing that rates charged shall be the same as the rates now in effect in Winchester and vicinity.

November 22: Provisional order issued permanently suspending and cancelling rate schedule IPUC 2 covering telephone service in Quincy by the Central Union Telephone Co., and permitting the company to place in effect IPUC 3 on December 1. If, upon further investigation, the new rates are found to be excessive, the company is to make refund of any such excess. No. 10452.

November 22: Order issued vacating and setting aside suspension and resuspension orders covering rates for tele-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phone service by the Central Union Telephone Co. in Gilman and Onarga, and permitting the new rates to become effective December 1, 1920; also requiring the company to set aside $95 monthly to provide for a depreciation reserve at Gilman and $108 for the Onarga exchange. No. 10428.

November 22: Provisional order issued vacating and setting aside order of October 19, 1920, suspending schedules of rates filed September 30, 1920, by the Murphysboro Telephone Co., except as to schedule affecting Metropolis, Brookport, Joppa, Samoth, Anna, and Jonesboro, and directing that the proposed increased rates in these cities be held in abeyance, pending further order. The company was authorized to place in effect December 1 revised schedules of rates IPUC 1 for Harrisburg, Eldorado, Galtia, Stonefort, Carrier Mills, Vienna, Grand Chain, Belknap, Cypress, Ozark, and New Burnsides; IPUC 2 for Murphysboro, Carbondale, Ava, Campbell, Hill, DuQuoin, Willisville, Benton, West Frankfort, Christopher, Royalton, Sesser, Thompsonville, Cobden, Marion, Herrin, Johnston City, Carterville, Creal Springs, Pittsburg, and McLeansboro; and IPUC 3 for Ewing. All terms and conditions of order approved June 16, 1920, except those which this order modifies, are to be continued in full force and effect. If, upon further investigation, the new rates are found to be excessive, the company is to make refund of any such excess. No. 9812.

November 23: Order issued authorizing the Mississippi Valley Telephone Co. to purchase from the Independent Telegraph & Telephone Co. all property located in Nauvoo, except cash on hand and accounts receivable, for $30,000, to be paid by assumption by the Mississippi Valley company of $13,500 of first mortgage bonds of the Independent Telegraph & Telephone Co., now outstanding, and issuance of $11,000 first mortgage bonds and $5,500 par value of notes of the Mississippi Valley company, $1,000 par value of said notes to be due one, two, and three years respectively after date, and $2,500 par value of said notes to be due four years after date, bearing 7 per cent interest. The Mississippi Valley Telephone Co. was granted a certificate of convenience and necessity covering the operation of a telephone system and authorized to issue $11,000 par value first mortgage 6 per cent bonds and $4,500 promissory notes. No. 11115.

November 23: Order issued authorizing the Baker Telephone System to continue in effect rate schedule IPUC 2 covering telephone service in Atlanta, Armington, and McLean; also directing the company to set aside $373 monthly to provide for a depreciation reserve. No. 10330.

November 23: Orders issued permanently vacating and setting aside suspension orders affecting rates for telephone service by the Albion Telephone Co., of Albion, and the Home Telephone Co., of Cairo, Mounds and Mounds City, and permitting the new schedules to become effective December 1. The Albion company was directed to set aside $55 monthly and the Home Telephone Co. $742 monthly to provide for depreciation reserves. Nos. 10732 and 10792.

November 23: Order issued suspending until April 16, 1921, proposed advance in rates for telephone service by the Byron Telephone Co., of Byron and Stillman Valley. No. 11117.

November 23: Order issued suspending until April 18, 1921, proposed advance in rates for telephone service by the Minier Mutual Telephone Co., of Minier, Mackinaw, and Stanford.

November 23: Order issued approving agreement dated November 17, 1920, between the Piatt County Telephone Co. and the Central Union Telephone Co. covering joint use of eight 35-foot poles and one 40-foot pole in Bement. No. E-1293.

November 23: Order issued suspending until April 8, 1921, proposed advance in rates for telephone service by the Chicago Telephone Co. in Chicago. Nos. 8672 and 9291.

November 23: Orders issued permanently vacating and setting aside suspension orders affecting rates for telephone service by the Boone County Co-operative Telephone Co., of Caledonia, and the Stronghurst Telephone Co., of Stronghurst, and authorizing the companies to establish the proposed increased rates December 1; also directing the Boone County company to set aside $164 monthly and the Stronghurst company $151 monthly to provide for depreciation reserves. Nos. 10785 and 10915.

November 23: Order issued permanently vacating and setting aside suspension order affecting rates for telephone service by the Vernon & Shobonier Telephone Co. in Shobonier, and permitting the proposed increased rates to become effective December 1. No. 10806.

November 29: Order issued resuspending until June 2, 1921, proposed advance in rates for the Foosland Telephone Co. in Foosland. No. 10786.

November 29: Orders issued permanently vacating and setting aside suspension orders affecting rates for telephone service by the Atwood Mutual Telephone Co., of Atwood and Hammond, and the Tri-County Mutual Telephone Co., of Creston, and permitting the proposed increased rates to become effective December 1; also directing the Atwood Mutual company to set aside $340 monthly to provide for a depreciation reserve. No. 10758 and No. 10787.

November 29: Order issued permanently vacating and setting aside suspension order affecting rates for telephone service by the Pike County Telephone Co. in Barry and vicinity and permitting the proposed schedule to become effective December 1. If, upon further investigation, the new rates are found to be excessive, the company is to make refund of any such excess. The company was directed to complete the rehabilitating of its property within 30 days, so far as improvements may effect service and improve operating conditions. No. 11105.

December 15: Hearing at Springfield before Commissioner Dempcy on application of Monmouth Telephone Co. for an order authorizing the issue of $35,000 of capital stock of the company.

December 17: Hearing at Springfield before Commissioner Dempcy in the matter of proposed increased rates of Ashland Telephone Co. for telephone service in Ashland, stated in rate schedule IPUC 3 of company.

INDIANA.

December: Citizens' Telephone Co., of Decatur, filed a petition asking permission to purchase the Monroe Telephone Co.'s system. The petition states that the Decatur company seeks to consummate the deal by the first of January, 1921. Should the petition be granted, the Decatur company would control the exchanges at Berne, Linn Grove, Monroe and Decatur. Over 40 miles of lines, stretching from Geneva to Fort Wayne, will be under the supervision of the Decatur company, and slightly in excess of 2,600 patrons in the county will be served.

December 6: Petition of Galveston Telephone Co. for permission to install and operate a system in Galveston, denied. Logansport Home Telephone Co. ordered to improve its service in that town and vicinity.

December 21: Hearing at Warsaw on application of Commercial Telephone Co. for increased rates.

KANSAS.

Novemper 30: The court granted increases in wages to employes of the Crawford Telephone Co., of Girard, Arma, and Cherokee.

November 30: Application filed by the Southwestern Bell Telephone Co. for authority to increase rates for telephone service in Baldwin, Meade, and Fowler.

MICHIGAN.

November 29: The commission has completed the inventory of the property of the Michigan State Telephone Co. it has been making for the purpose of an appraisal on which to base rates.

December 6: Hearing at Lansing in the case of the Valley Home Telephone Co. and the Michigan State Telephone Co. relative to a physical connection of their lines.

MINNESOTA.

November 27: Order issued denying the application of the Becker-Mahnomen Telephone Co. for permission to increase its rates from $2.75 to $3.50 for independent telephone service in Detroit.

December 11: Finlayson Co-operative Telephone Association, of Finlayson, given authority to place into effect charges for service connection, change of name, moving from one location to another, and other miscellaneous charges, effective January 1, 1921.

December 15: Hearing at St. Paul on application of Northwestern Telephone Exchange Co. for increased rates.

December 16: Hearing at St. Paul on application of Tri-State Telephone & Telegraph Co. for increased rates.

MISSOURI.

November 16: Schedule of Albany Telephone Co. filed for effectiveness May 1, 1920, rejected by commission, but company allowed to file another one effective upon one day's notice containing a charge of 25 cents for desk set. A toll charge of 5 cents is allowed for three-minute talks from Albany to certain towns and a 10-cent-per-message charge from Albany to certain other towns. The company at the other end of the line is not required to make the same rate over the same line.

November 27: Schedule of toll rates charged by Salisbury Home Telephone Co. and Chariton County Telephone Co. between Salisbury, Keytesville and other points ordered continued for a period of 13 months from December 1.

MONTANA.

November 29: Application filed by the Mountain States Telegraph & Telephone Co. for authority to increase its rates for business telephones $1 a month in Belt.

NEBRASKA.

November 29: Application filed by the Union Telephone Co., of Bloomfield, for authority to increase rates 25 cents per subscriber. The company claims that its revenues have not been sufficient to provide for depreciation.

November 30: The commission authorized the Plainview Telephone Exchange, of Plainview, to place in effect the following schedule of monthly rates: Business, $2.25; residence, $1.40; farm, $1.60; and switching, 50 cents.

November 30: Application filed by the Lincoln Telephone & Telegraph Co. for authority to increase rates in 13 cities and towns of southeastern Nebraska and for permission to continue in effect its present

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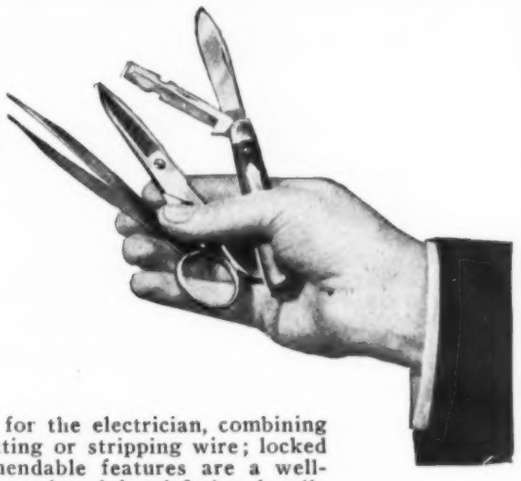

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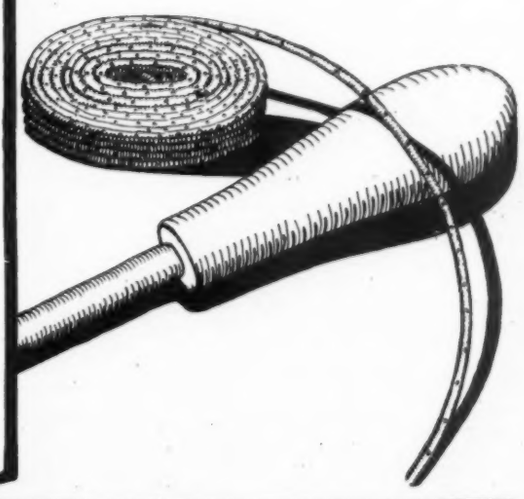

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rates, which expire December 31 by limitation of the commission's previous order increasing them above the pre-war scale. The company also requests an advance of 25 cents in the switching rate charged for farm lines at various towns and for the discontinuance of free service between Fairbury and Reynolds.

December 6: Application of the Arcadia Electric Light & Telephone Co. for an increase in rates, granted. The financial condition of the company as checked by the commission, indicated the necessity of additional revenues.

December 6: Complaint filed by J. M. Shreve, of Bartlett, against Bartlett & Erickson Telephone Co., alleging overcharge on toll message.

December 7: In the matter of the application of the Bertrand Telephone Co. for an increase in rates, it appearing to the commission that the revenues of the company for the current year are sufficient to pay all proper charges and a reasonable return on the value of the property, application was denied with permission to company, if revenues fail to give proper return, to file application for elimination of free service to adjacent towns.

December 7: On the application of the Union Mutual Telephone Co., of Union, for permission to charge 25 cents additional and publish gross rates, authority was granted on condition that rate be added only if payments are not made before the 10th of the month on current bills or before the second quarter on quarterly accounts.

December 7: Application of the Jackson Telephone Co. for continuance of temporary rates granted and supplemental order issued.

December 7: Complaint filed by Mrs. Vannoy, of Axtell, against Kearney Telephone Co., alleging refusal to furnish service requested.

December 8: On the application of the Curtis Telephone Co. for permission to reduce switching rates from 50 cents, as fixed in a recent order, to 40 cents, on the ground that this charge puts a hardship on certain small farm lines, it was ordered that company be permitted to reduce rate 5 cents, and shall hereafter publish, as a part of its schedule: Switching charges, net, 45 cents a month; gross, 55 cents.

December 8: Hearing at Wausa on application of Union Telephone Co., of Bloomfield and Wausa, for increase of rates; appearances: for company, E. M. Morsman, attorney, and J. E. Baggstrom, general manager; for the city of Bloomfield, W. E. Funk, attorney; for the city of Wausa and sundry farm lines switched by applicant, P. H. Peterson, attorney; testimony taken, submitted on record, and taken under advisement.

December 8: Application of the Hamilton County Farmers' Telephone Association for permission to destroy records, granted on condition that none be destroyed unless over six months in use.

December 9: In the matter of the application of the Ravenna Telephone Co. for permission to increase rates it appearing that the company has had no increase during the war period and has been conducting its business at a loss for the last two years, application was granted and authority to publish a new schedule issued.

New Jersey.

December 10: New York Telephone Co. allowed increases in toll rates within the state approximately the same as those fixed by Postmaster General Burleson.

December 10: Application of Delaware & Atlantic Telegraph & Telephone Co. for increased rates, denied.

New York.

December 6: The West Valley Telephone Co., operating in Ashford, Ellicottville, Machias, and Yorkshire, will increase its annual rates for residence service on individual and four-party lines $6 a year, effective January 1. A like increase will be made for multi-party line business service and rural line service, both business and residence.

December 6: The Monticello Telephone Co., serving Monticello and various hamlets in the towns of Fallsburg and Thompson will increase its annual rates for individual line business service $6 a year, effective January 1, and all other classes of service $3 a year, except for rural line residence service, which will continue at the same rate. Extension station rates will also be increased $3 a year.

December 6: Tariff filed by the Delhi Telephone Co., serving Delhi and six towns in Delaware county, increasing its annual rates, effective January 1.

December 6: Tariff filed by the Farmers Village Telephone Co., of Groton and Moravia, and 12 towns in Cayuga and northern Tompkins county, increasing its monthly rates, effective January 1, as follows: Individual line business, 75 cents; two-party line business and residence, four-party line residence, and rural business service, 50 cents; and individual line residence and rural line residence, 25 cents a month. The new tariff cancels the present two-party line business rate and establishes new multi-party line rates: $3 a month for business service and $2.25 a month for residence service.

December 6: Tariff filed by the Patrons Telephone Co., of Ira, increasing its rates for individual, multi-party, and rural line service; also cancelling its two-party business and residence service, effective January 1.

December 9: Tariff filed by the Subscribers' Telephone Co., operating in Woodridge and in hamlets in Fallsburgh and Neversink townships in Sullivan county, to increase its rates for telephone service.

December 13: Hearing at New York before Chairman Hill in the case of John A. Connolly vs. New York Telephone Co. relative to rates charged in apartment houses and hotels in New York City.

December 13: Hearing at New York on petition of New York Telephone Co. in respect to increasing rates, tolls and rentals to be charged by it for telephone service in New York City.

December 16: Hearing at Albany in the case of George S. Buck, as mayor of Buffalo vs. New York Telephone Co., as to tariff of telephone charges, effective May 1, 1918.

December 16: Hearing at Albany in the case of Walter R. Stone, as mayor of Syracuse, vs. New York Telephone Co., as to rates effective December 1, 1919.

North Dakota.

December 10: The Tri-County Telephone Co., operating in Petersburg, Niagara and Dahlen, given authority to increase local and rural rates, effective January 1, 1921.

December 10: Temporary increased rates, pending completion of inventory and establishing of reasonable rates, allowed the Ligerwood Rural Telephone Co. for its exchanges at Ligerwood and Geneseo. Service connection and move charges are also specified to be established. The company also operates an exchange at Veblen, S. D.

December 10: Brinsmade Telephone Co., operating switchboards at Brinsmade, Harlow, and Baker, allowed temporary rates and service connection charges, pending results of evaluation of the company's property.

December 10: Brocket Farmers Telephone Co., of Brocket, failed to file a schedule of increased rates before placing it into effect last January, the officers claiming they had no knowledge of legal requirements. Ordered that rates be made temporary pending evaluation of property and that service connection and move charges be established.

December 10: Rates of Stanley Telephone Co., of Stanley, temporarily increased, pending evaluation of its property by commission. Company ordered to establish class D accounting system prescribed by commission March 5, 1916. Service connection charges are also specified.

Ohio.

December 1: Colebrook Telephone Co., of Colebrook, filed rate schedule effective January 1, providing a rate of $12 a year payable quarterly in advance.

Oregon.

December 21: Hearing at Portland on application of the Pacific Telephone & Telegraph Co. for authority to increase rates throughout the state.

Pennsylvania.

November 30: New schedules of rates filed by the Juniata Valley Telephone Co., operating in McVeytown and vicinity. Rates for residence telephones are to be increased to $18 and business telephones to $24.

December 3: New schedule of rates filed by Valley Telephone Co., of Emlenton, Venango county.

West Virginia.

November 27: Chesapeake & Potomac Telephone Co. given authority to increase rates throughout state, averaging 20 per cent, effective December 1.

Wisconsin.

November 29: Hearing at Madison on application of the Poynette Telephone Co., of Poynette, for authority to increase rates.

December 13: Hearings at Madison on applications of the Hartford-Saylesville Telephone Co., of Hartford, the Rubicon Telephone Co., of Hartford, and the Hartford Rural Telephone Co., for authority to increase their rates for telephone service. U-2341, U-2335, U-2336.

December 13: Hearing at Madison on the application of S. V. Topping, of Wisconsin Rapids, for authority to increase his rates for telephone service. U-2307.

December 13: Hearing at Oconto on the application of the Oconto Rural Telephone Co., of Oconto, for authority to increase its rates. U-2328.

December 15: Hearing at Madison on the application of the Junction City Rural Telephone Co., of Junction City, for authority to increase its rates. U-2311.

December 15: Hearing at Madison on the application of the Marion & Northern Telephone Co., of Marion, for authority to increase its rates. U-2312.

December 16: Hearing at Madison on the application of the Princeton Telephone Co., of Princeton, for authority to increase its rates. U-2316.

December 16: Hearing at Madison on the application of the Juneau Telephone Co., of Juneau, for authority to increase rates. U-2317.

December 17: Hearing at Madison on the application of the Gilman & Western Telephone Co., of Gilman, for authority to increase its rates for telephone service. U-2338.

December 17: Hearing at Madison on the application of the Jefferson Mutual Telephone Co., of Jefferson, for authority to increase its rates. U-2322.

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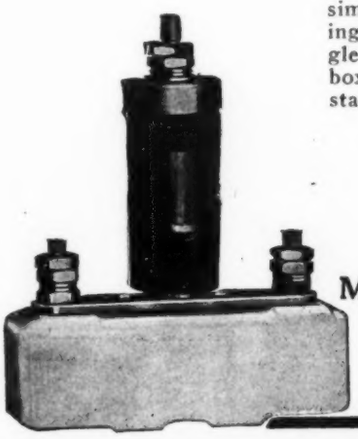
The new D.S. Types represent the latest and highest development in lightning protection. These arresters are the result of long and untiring efforts on the part of our experts. They embody every feature that makes for better telephone protection.

The New BRACH Arresters are adaptable to your present equipment or to our simple, inexpensive mounting. Made in types for single line, double line, pole box groups and central stations.



Write us today for full particulars.

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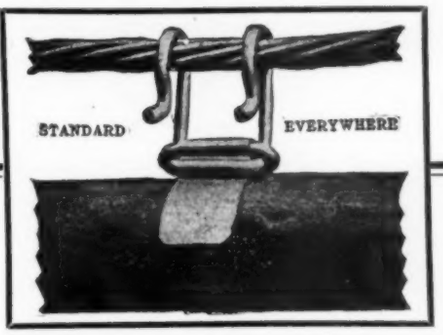
L. S. BRACH MANUFACTURING COMPANY

NEWARK, N. J.



BOSTON CABLE CLIPS

Strength
Simplicity
Durability

The Boston Clip consists merely of two pieces of wire and a strap of substantial sheet metal—no rivets, pins or buttons with consequent breakage. Wholly attached by hand, more easily, quickly and firmly than any ring demanding the use of pliers. Holds so firmly that it can not creep, even on a sloping cable.

THE CHASE-SHAWMUT CO., Newburyport, Mass.

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Please tell the Advertiser you saw his Advertisement in TELEPHONY.

From Factory and Salesroom

Conventions: Penn., Harrisburg, January 6-7-8; Minnesota, St. Paul, January 25-26-27

Kellogg Board Installed in New Exchange at New Boston, Ohio.

In November, the Portsmouth Telephone Co. celebrated the second birthday of its fast-growing infant plant in the busy village of New Boston, Ohio. This youngster started in life with 165 common battery and 30 magneto stations and has gained 235 common battery and 12 magneto stations, making a total of 400 common battery and 42 magneto stations at the present time. New orders are constantly coming in and the management is beginning to wonder if its present home will house it for a reasonable length of time.

The board, being one that has to serve a mixed class of service, is equipped with most of the late Kellogg features and gives a good class of service. One operator has put through more than 325 calls per hour at different times on this board. This is fast service, as a large part of these calls were either incoming or outgoing trunk and magneto calls.

The first and second positions are duplicates in the way of equipment, each having, in the way of cord circuits, one toll trunk, five incoming common battery trunks, two pairs of toll-to-toll and toll-to-local cord circuits and eight common battery cord circuits. The third position is equipped with four magneto and toll-to-local, four pay station and eight common battery cord circuits. Switching keys are cut in so that all circuits are available to one position.

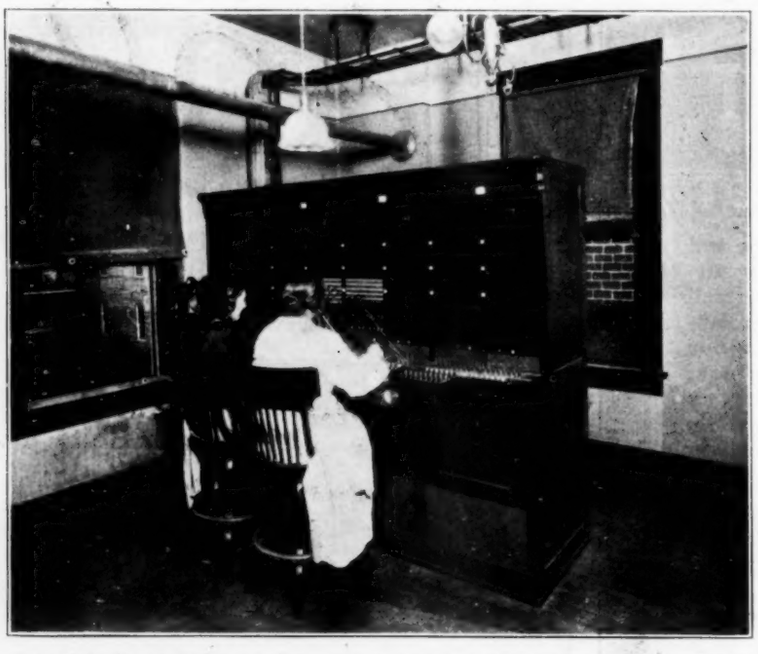
The magneto trunks are jack and drop-ended; all others are plug-ended. The cabinet is built for 1,000 lines multiple, but at present is equipped with only 160 common battery and 10 magneto lines, most of which are in use.

In the terminal room are located the Cook rack, which is equipped with two 100-line cable uprights and 210 trunk and line No. 60 protectors; trunk and line relay rack; two small power panels, on one of which are mounted the small rectifier and associate switches, and on the other all switches and fuses for distributing the power. The duplicate sets of Kellogg 6A pole changers with transformer cabinet, are mounted on the wall near the power panels.

The battery room is at the rear of the terminal room and contains duplicate sets of Type E 5-plate Chloride Accumulators. The battery and generator supply for a 150-line Kellogg P. B. X. in a nearby steel plant are also fed from the exchange power equipment.

A good cable distribution consists of one 200-pair, No. 22 gauge cable. Cutting out at convenient points over the plant, keeps the length of open wire lines down to a minimum. Most of the cable is laid in fiber duct and some is simply buried. One 100-pair branch contains a core of 25-pair, No. 20 gauge wires to handle the trunks between the Portsmouth and Sciotoville exchanges, New Boston being between the two. The officers expect to soon add another 200-pair cable, as the present facilities are getting crowded.

The future assures rapid growth for this exchange as neighboring plants are growing rapidly.



The Switchboard in New Boston Exchange of Portsmouth Telephone Co.

Coffey in New Quarters—New Department Added.

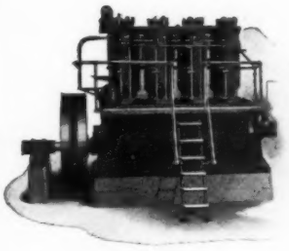
The Coffey System & Audit Co., Indianapolis, Ind., has moved its offices to the ground floor at 118 E. New York St. During the past year, its business, particularly the central accounting department, increased to such an extent that the need for larger quarters was felt some time ago.

In Addition to Accounting, Coffey Will Sell Dry Batteries.

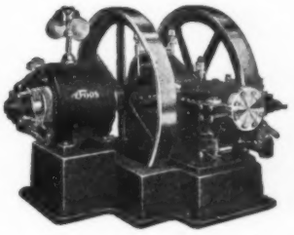
Originally the central accounting department was created for the convenience of the smaller telephone companies that found it impossible to secure competent bookkeepers in their own towns. While the Coffey System & Audit Co. is adding companies in this class to the service monthly, it is also taking in the larger companies with from 1,000 to 8,000 subscribers which not only find a saving of about 75 per cent, but appreciate the service of keeping their accounts right up to the minute, and through the Coffey method of checking all distribution, receipts, etc., find it equal to a perpetual audit.

In its new quarters, the Coffey System & Audit Co. branches out into other lines. It is now Indiana distributor for the French Battery & Carbon Co., and is carrying a big stock of batteries ready for immediate shipment to all points in the state. It may be interesting to know

THE FOOS



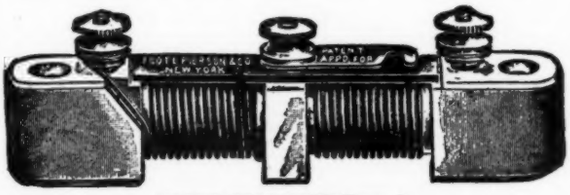
POWER service the keynote to Foos Policy. We cooperate with telephone engineers to select the most suitable exchange equipment. Our engineers are able to discuss your requirements from an experience covering a number of years with conditions around battery charging plants. On account of this, definite results are obtainable from a Foos installation without any experimental risk.



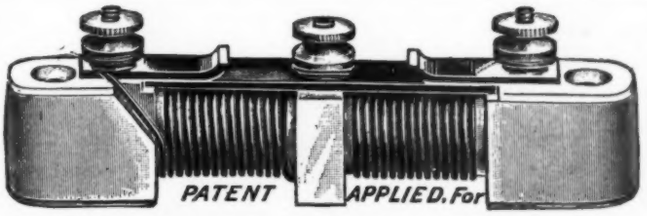
THE FOOS GAS ENGINE CO., SPRINGFIELD, OHIO

ARGUS PROTECTION MEETS EVERY REQUIREMENT

The dependability of ARGUS Arresters is almost proverbial among telephone men. When you install these economical but sure protectors, you enjoy real immunity from lightning and other electric troubles



ARGUS STANDARD Type A



Type "C" Combined Argus Lightning Arrester and High Tension Protector

offers you adequate protection against high tension currents as well as the other proven features of Argus Arresters.

Simple, foolproof, adaptable — Write for literature

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Telephone Wire and Cables

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Hold firmly.
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ORANGEBURG FIBRE CONDUIT

THE STANDARDIZED CONDUIT

WRITE FOR PARTICULARS—BOOK H

FIBRE CONDUIT CO.
ORANGEBURG N. Y.

NEW YORK CHICAGO BOSTON
SAN FRANCISCO NEW ORLEANS

Please tell the Advertiser you saw his Advertisement in TELEPHONY.

that through the Coffey reputation for prompt service, orders for batteries were obtained before the stock was received.

John W. Coffey, head of the Coffey organization, states that the new department is being handled entirely separate from the accounting department, and will not, in any way, interfere with the usual service given patrons of the accounting and auditing departments.

Small Iowa Telephone Company in New Building.

The Farm Mutual Telephone Co., with headquarters at Grimes, Iowa, of which W. H. Kent, of Dallas Center, is president, has just completed and is now occupying one of the most modern and up-to-date telephone buildings of its size in the state of Iowa.

The building is of fireproof construction, finished in kellastone, with a tile roof, and contains a large operating room, a secretary's office, two living rooms for the night operator, and a shop.

The building was designed by E. R. Thornburg, secretary and general manager of the company. Mr. Thornburg graduated from the electrical engineering department of the Iowa State College in 1913, and has been with the company six years—two years as superintendent and four years as superintendent and secretary.

All cable, terminal rack, switchboard, and other equipment were purchased from the Stromberg Carlson Telephone Mfg. Co. some six years ago. Since then the company has purchased the interests of the Iowa Telephone Co., at Waukee, and rebuilt the Waukee exchange, installing Stromberg-Carlson equipment.

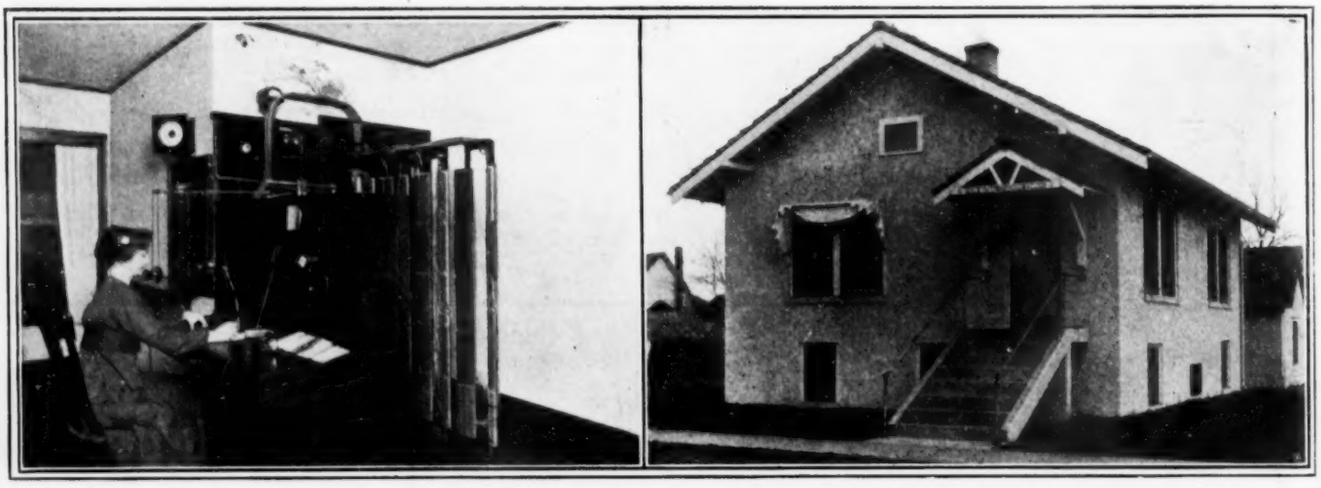
Mr. Thornburg states that 93 per cent of the homes and business places within the territory served by the company are telephone subscribers.

Book Review.

HENDRICKS' COMMERCIAL REGISTER OF THE UNITED STATES, 29th edition. Published by S. E. Hendricks' Co., Inc., New York. Price $12.50.

A study of the new 1921 edition of Hendricks' Commercial Register reveals that the publishers have maintained the high standard of this book, have retained all of its good features, and have added some new ones. One of the striking features of the book is its simple method of arrangement and complete index, making it a most easily used book of its kind. This ease of use is further increased by the exterior index a feature added last year and continued in the new edition. The lists relating to the various industries are complete and up to date.

The book is divided into five sections, the "Index to Trades," "Classified Trades," "Trade Names," "Alphabetical," and "Advertisers Index." The purpose and use of each is fully explained.



Equipment of the Farm Mutual Telephone Co. Was Moved From Old Building to Modern New One at Grimes, Iowa.

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PROMPT SHIPMENTS ASSURED
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SHIPMENTS AS ORDERED
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Telephone Construction Material, Equipment and Supplies
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